TERRA

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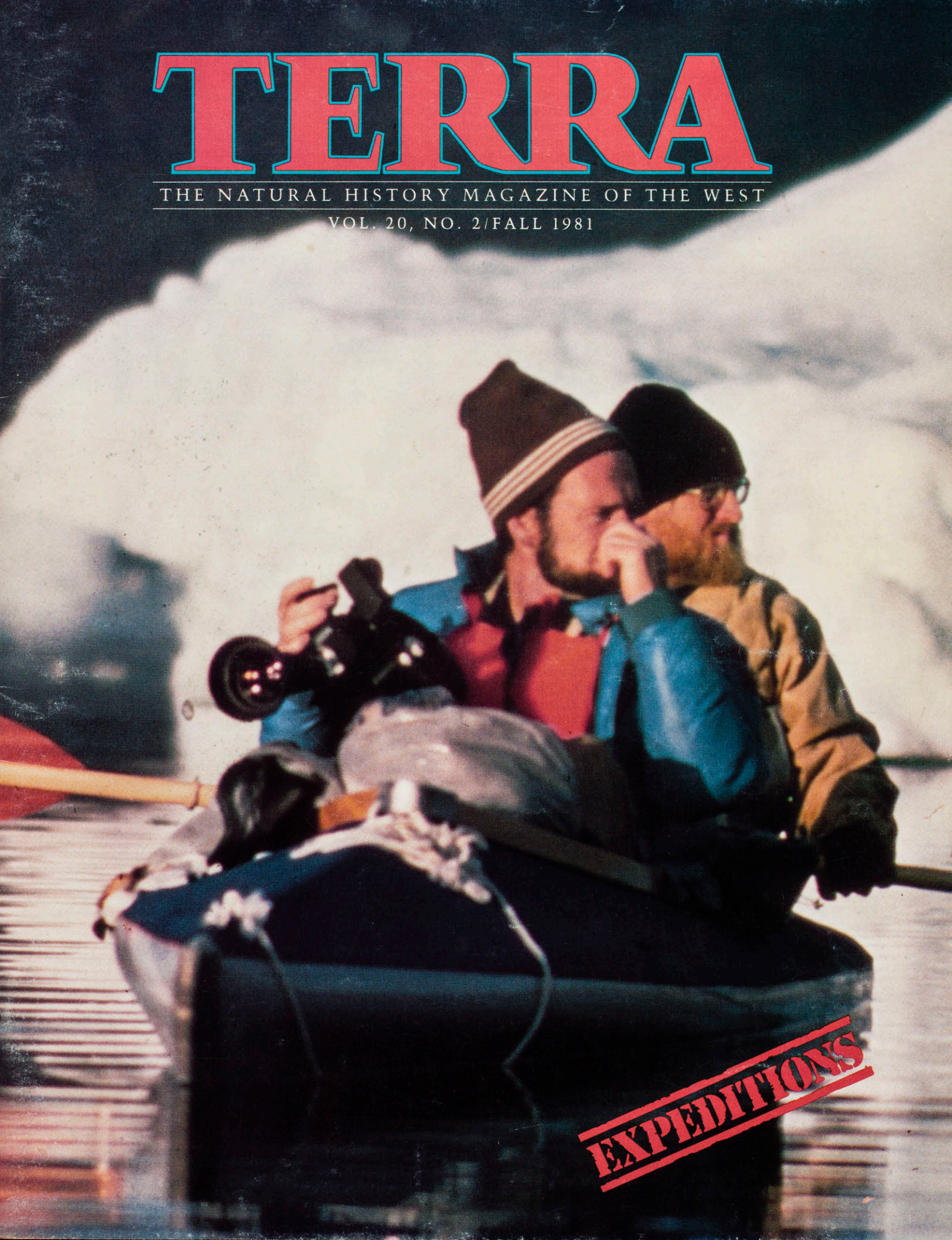

EXPEDITIONS

GOOD-BYE, DR. LEE

Once again the Natural History Museum of Los Angeles County is without a titular head following the resignation of Dr. William B. (Pete) Lee, Director, effective October 3, 1981.

While Dr. Lee's short stewardship did not allow him time to chart new courses for the Museum, he did succeed in leaving a lasting imprint on the staff, the various boards and the many friends of the Museum. In sorting out his various accomplishments as Director, it is probably fair to highlight as his most meaningful contribution to the Museum the highly successful exhibit of Colombia Gold and Emeralds: "Sweat of the Sun, Tears of the Moon." From concept to closing, Dr. Lee personally involved himself in all aspects of the exhibit. Without a doubt it proved to be the outstanding exhibit at the Natural History Museum within recent memory, and 1236 new members joined us because of it.

Additionally, during Dr. Lee's five-plus years as Curator of Anthropology (prior to becoming Director) he did a truly outstanding job of curating a significant but totally disorganized collection of anthropological material into a properly organized, properly cataloged, and properly warehoused asset to the Museum.

Dr. Lee's friendliness and compassion made him readily approachable by all of those involved with the Museum. He truly tried to be a friend and confidant of everyone with a problem. Ironically, these same qualities also made him vulnerable and made the Director's chair a lonely spot come decision-making time—a situation of lasting concern to Dr. Lee.

In his resignation comments to a joint meeting of the Board of Governors and Foundation Trustees, he recalled that he had chosen anthropology as a life's work because it offered the broadest possible spectrum of intellectual pursuit and he was essentially interested in everything. He went on to say that he had found the Director's chair to be a confining and stifling increment in his intellectual life style. Hence he has chosen to return to the broad spectrum of academic pursuits that first interested him as a small child in Alabama. As he said, "I am now going to polish my own cannon."

We are certain that all of the staff, members of the various boards and friends of the Museum hope he finds a lot of cannons to polish. From all of us we can only say, "Dr. Lee, we will miss you."

—The Editors

CURATORS ON THE MOVE

DR. JOHN HARRIS, Chief Curator of Earth Sciences, returned to Los Angeles towards the end of September after a two-month trip abroad. He spent the last week of June in Paris, where he had been invited to attend an international symposium on "the environment of Plio-Pleistocene hominids" sponsored by the Singer-Polignac Foundation. From Paris he traveled on to Kenya where he divided his time between successfully prospecting for further fossiliferous sites along the shores of Lake Turkana and the National Museum in Nairobi where he continued his researches on Kenyan fossil mammals. Much of his stay in Nairobi was spent studying a newly discovered skeleton of *Sivatherium* (a short-necked, long-horned, extinct relative of the giraffe), which proved to be the most complete example of this strange beast yet found anywhere in Africa. This portion of his trip was funded by the Foundation for Research into the Origin of Man. Dr. Harris returned via London, spending several days in the various museums gathering inspiration for new exhibits.

DR. KENNETH E. CAMPBELL, Curator of Vertebrate Paleontology, traveled to Bolivia during May and June where he carried out geological research and collected vertebrate fossils in collaboration with scientists from the University of Florida and the Geological Survey of Bolivia. Working in remote locations ranging from the high mountains in southern Bolivia where temperatures fell well below freezing nightly to the steaming Amazon jungle of northern Bolivia, Dr. Campbell continued work initiated in earlier years and began work at new sites in this cooperative research program funded primarily by the National Science Foundation.

Dr. Campbell has also recently received a grant from the National Geographic Society to continue his studies on the Big Bird from Argentina and other teratorns. He will be traveling to several countries in South America next Spring in search of additional specimens of these giant birds.

DR. RALPH SCHREIBER, Curator of Ornithology, and wife, Betty Anne, Research Associate, are spending November and December in India studying the behavior of the Grey Pelican as part of their comparative study of the family Pelecanidae. Ralph received research support from the Mutual Educational and

(Continued on Page 38, Col. 2)

TERRA

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Dr. Don Reynolds, Curator of Botany, who originated the idea of an Expeditions Issue of TERRA, has been indispensable in its fruition. Without his efforts as guest editor, we never could have made the verbal trek around the world with all our curators.

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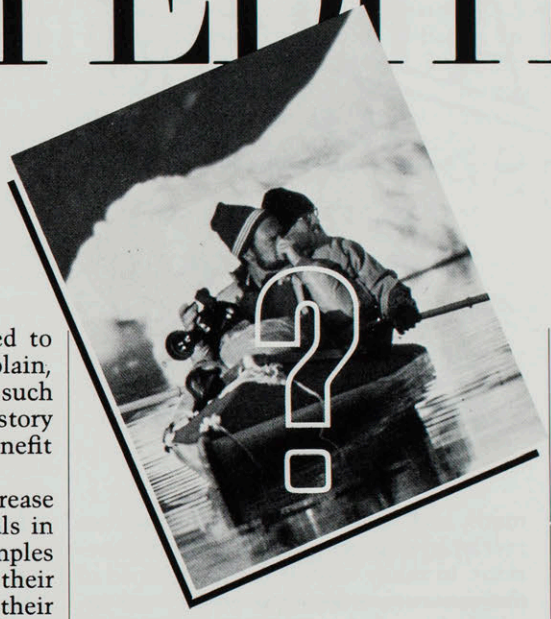
ABOUT THE COVER

Photographer Kevin Duffy and curator Don Patten (providing the paddle power) prove they're equal to the challenge of arctic waters of northwest Greenland. Their rubberized collapsible kayak allowed them to observe Eskimo hunting activities and to travel to temporary whaling camps. Photo: Ivars Silis.

WHY MOUNT EXPEDITIONS



This issue of TERRA is devoted to Museum expeditions, aiming to explain, within the limits of forty pages, how such trips sponsored by the Natural History Museum of Los Angeles County benefit both science and the public.

Museum biological curators increase their understanding of the materials in their care by collecting adequate samples of living organisms, documenting their ecological context, and observing their interaction with other animals and plants in the same environment. Paleontologists collect fossils, the living organisms of the past, but also observe and record the geological context of the fossils to make deductions about their age and ecology. Historians document different aspects and examples of material culture. It is for these reasons that museums mount expeditions.

Past expeditions have resulted in the preservation of unique biological and cultural materials that might otherwise have been lost to posterity. Natural habitats of many of the plants and animals in our Museum's collections are becoming threatened as urban populations increase and more virgin land comes under cultivation. The classic localities of many of the fossils are disappearing under new housing developments, and many examples of historical, social, and industrial architecture are being demolished in the name of progress. Current expeditions are therefore being organized with a new sense of urgency despite the difficulties imposed by increasing financial and legislative restrictions.

Expeditions are also taking on an additional mission. The very act of collecting scientific and cultural objects to conserve them has sometimes been construed as scientific imperialism and cultural rape by the countries to which the expeditions went. Participants in Museum expeditions are seeking to overcome such a stigma by collaborating closely with the scientists in the host countries, undertaking joint projects, and offering help and guidance in the form of training. They are thus acting as ambassadors as well as explorers.

A common thread unites the diversity of topics covered in this issue of TERRA. The difficulties of funding are discussed first. Then comes a major story resulting from interviews with Museum staff from many disciplines recounting their experiences in the field. Many of the anecdotes show that there are light moments in otherwise arduous and exacting tasks, often performed under physically strenuous conditions. An article about "old-time" expeditions is presented to show the contrasting styles of then and now (that early expedition is documented by films now reposing in the Museum's archives). An essay about the early exploration of Hawaii, the changes wrought by introducing new animals and plants plus the destruction of a civilization, addresses serious problems which have no easy solution. The differences between expectations and realities of an expedition to Brazil's Amazon Basin is described by another author. Richard Leakey provides a Third World viewpoint.

The common thread of the articles is the spirit of inquiry that has always inspired both grand expeditions to distant lands and less exotic forays into our own back yard. The mission of the Museum becomes clear. We are here to *EXPLORE* (in the broadest possible sense of inquiry and research), to *PRESERVE* (by collecting and conserving parts of our environment which would not otherwise be saved), to *EDUCATE* (through interpretive exhibits and historical and scientific publications), and to *SERVE* (sharing knowledge with those who need our resources to create a better equilibrium between society and environment).

TERRA hopes that this issue will promote understanding and support for the Museum's continuing expeditions in the field.

—The Editors

TERRA is grateful to Dr. John Harris, Dr. William B. Lee, and Dr. Don Reynolds for their involvement in this editorial.

CURATORS AFIELD: PROCESS AND PURPOSE

by CHARLES L. HOGUE

I have been amused and slightly annoyed from time to time by friends who ask me, "Charlie, where is the Museum going to send you next?" It is the word "send" that triggers my feelings: amusement from the naiveté evident in the layman's presumption of the nature of museum expeditions, annoyance from my own personal experience of the difficulties involved in generating and carrying out field work. Thus, my usual response to the question is a polite explanation of the processes and purposes of expeditions and curatorial activities afield.

Today, few museums operate with sufficiently large budgets to support field trips adequately. Financial realities in these times place tight restrictions on the curator's mobility and sometimes force him to assume roles outside his academic regimen and training in order to find funding for travel to collecting or study sites away from the museum itself. Rarely does the curator find it necessary to preempt his schedule to take advantage of a field trip offer; on the contrary, normally he will plan his entire working schedule around the possibility of getting into the field, generating his own support in any way he can.

The acquisition of materials, specimens, and data is essential to museum research, education, and exhibit functions. In many ways it is the lifeblood of the museum, making it go forward instead of remaining static.

The prospect of creating funds for field work daunts all but the dedicated. Time and energy which could go into collection management and research must be spent on diplomacy, proposal writing, or downright hustling in order to put together the where-with-all to support an expedition.

And the expeditions, once launched upon, entail hard work and long hours of activity, often under primitive and difficult conditions. Scientists are eager to make the most of their hard-gained field time, and lose weight and sleep while engaged in collecting work and logistic difficulties.

Despite everything, curatorial zeal always runs high for field activity. Often the curator spends considerable sums of his own money in order to make the travels he finds essential to his job. Monetary aspects of museum expeditions are not usually mentioned to members. I, however think it is important to give members information about expedition funding.

Basically, funds come from two sources: private donations, including corporate grants, and various public agencies. As just mentioned, private sources all too often include the curator's personal bank account. Seldom does one of our own staff settle his accounts from an expedition without contributing several hundred dollars. Travel costs keep going up, and the long time between proposals and acceptance is such that yesterday's budget is today's deficit. Thus, the amount curators donate to field work is a measure of their dedication to their science.

Tax benefits are a significant factor in the availability of monies from museum benefactors. More than that, these individuals have a highly developed sense of academic or cultural commitment which they exhibit by sponsoring museum expeditions. I think the majority of man's fund of natural history information owes its existence to the philanthropist.

The Natural History Museum is full of objects on display that are the result of benefactor-sponsored expeditions and field trips. Gems, habitat animals and botanical specimens, birds, fossil bones, and insects are only a part of the carefully collected and preserved materials. And publication costs of many of the Museum's Contributions in Science series

have been underwritten privately.

Private sponsors often participate actively in expeditions. They may be sportsmen who hunt or fish with other than trophies in mind. Understanding the value of biological specimens, they organize their safaris so that curators and scientific goals are included. Not only are the sponsors' goals realized, but ancillary material is taken for inclusion in habitat groups or in reference collections or to supplement collections in other disciplines. Insects, shells, plants, small mammals, underwater photographs, etc., are as important objectives of the hunt as antelope or billfish.

Non-participating sponsors make financial support available for some specific expedition, usually one that interests them personally.

The Museum Foundation channels all the monies for privately funded expeditions. This is because private and public funds are not co-mingled. There are often tax advantages for public-spirited people well-enough-off to take advantage of them. The Museum Foundation is prepared to advise and and help anyone who cares to support and/or participate in an expedition.

The Foundation also may fund some expeditions from endowment income. Indeed, in view of current trends toward reductions of tax monies available to the Museum, our Foundation's relative importance in this area is rapidly growing. Los Angeles County deleted travel from the museum's budget following Proposition 13. Staff travel in the last two years has only been possible through the assistance of the Museum Foundation. For this the curators are very grateful.

In a sense, the Foundation is acting as a private granting agency when helping the Museum with its field program. Only a few other similar agencies among the myriad of private foundations that exist in the United States provide support for museum type activities. Some which have helped our scientific work are the National Geographic Society, American Philosophical Society, Janss Foundation for Marine Research, Xerces Society, and International Wildlife Federation.

Public granting agencies for the support of natural history in this country are even fewer than the private. The greatest of these, of course, is the National Science Foundation, financed by Congress.

One division of NSF, the Division of Systematic Biology, primarily is responsible for the kinds of studies done by museum curators, i.e. taxonomy, biogeography, behavior, and natural history. However, several other divisions may at times cover projects done by non-taxonomic-oriented disciplines, such as anthropology, earth sciences, and ecology. (The Biographical Research Resources Program helps with the physical needs of collections management, and thus is indirectly involved with some aspects of expeditions, but does not finance field research per se.)

Like the County budget, that of NSF can expect to be severely restrained by current fiscal policies in Washington. Thus we can expect private support of museums throughout the United States to assume ever greater significance.

Some public agencies other than NSF have supported our scientific staff in research projects involving expeditionary field work. These are usually administered as contracts with the Foundation, or directly with the curator if administrative aspects are simple. Agencies funding our research include the U.S. Navy, the Office of Naval Research and Naval Facilities Engineering Command, U.S. Army, Medical Research and Development Command, U.S. Air Force, Space and Missile System Organization, California Coastal Commission, U.S. Department of the Interior, Office of Endangered Species, California State Department of Fish and Game, National Park Service and National Marine Fisheries Service, Seagrant Program.

"The point is that it is curators themselves who ultimately make expeditions possible. Zeal, energy, and resourcefulness are required, plus the ability to stick with it."

Writing a grant proposal is a complex and trying task, difficult and time-consuming. It is an art in itself, probably a reason why many scientists try to avoid the process altogether. And grantmanship is not an ability easily acquired by the busy curator. Format and details of eligibility require strict attention. Scientific accuracy and knowledge of the field has to be apparent to the group that will pass judgment on the proposal. Most of all, strong justification must be given for doing the work and making the trip. The budget must be meticulously outlined and justified. And then there is a long wait.

Unhappily, many worthy projects never receive the support they deserve. Others may become "Prox-mired," that is, subjected to ridicule because of the appearance of being frivolous or downright ridiculous (named for Senator Proxmire of Wisconsin, who annually presents his "Golden Fleece Award" for the most outlandish research proposal funded by government agencies). Frequently such criticism comes from ignorance of the scientific method and priorities in the progress of some esoteric field of investigation.

A curator can do a lot to help his own research cause. By becoming well-known and important in his subject, he can be in demand to give conferences and work abroad and as an important scientist, will be invited by foreign governments and even private companies to go where needed. He also may affiliate with other distinguished workers who might be better grant proposal writers than he.

Another alternative for the curator is to conduct guided tours or help in other commercial activities in the geographic area of the curator's research concern. Travel agencies, for instance, may pay major expenses to and from a field site and all the scientist need do is spend a portion of his time interpreting natural history to a group which soon departs, leaving him to his field work.

A variation on the last method is becoming popular. It might be called the public participation program. Certain non-profit organizations exist which advertise expeditions being carried on by subscribing scientists and the public is invited to take part. For a prescribed donation, the participant goes with the curator and other members of the field team to the site and takes part in the work. A portion of the amount collected helps support the curator and his project, the remainder goes to administration. Everybody benefits. Two well-known such organizations operating with considerable success today are Earthwatch, based in Belmont, Massachusetts, and University of California Research Expeditions Program. Two Natural History Museum projects have been supported by participation in the former's group. These variant methods do work; I know, for I have used them myself.

The point is that it is curators themselves who ultimately make expeditions possible. Zeal, energy, and resourcefulness are required, plus the ability to stick with it.

Good scientists certainly recognize field study as essential both for adding to museum collections and for research. The very word expedition is ironic in this context; it derives from the same root as "expedite," meaning to carry through with dispatch, free of impediment! Nothing is further from being free of impediment than the execution of an expedition. From the greatest and first hurdle funding, to complicated travel plans, and then the often-arduous adventure itself, an expedition is a hazard. But it is a hazard worth the doing because it enriches the Museum as a repository for knowledge for ourselves and generations to come.

Dr. Charles L. Hogue is Curator of Entomology at the Natural History Museum of Los Angeles County. He has just returned from an expedition to Africa about which Terra hopes to report in depth at a later date.

LOVING IT WHILE LIVING THROUGH IT

By the time Jim Olson, Head of Habitats, ended his hike into the Congo jungle to study Lowland Gorilla habitats to make a scientifically accurate museum display, he had eaten three kinds of monkey, been swarmed by bees, overrun by army ants, and in a storm had slept in a thatch lean-to stacked like a spoon with nine pygmies who advised that, if push came to shove, he should turn his back to a charging gorilla so only his buttocks would get bitten.

When Camm Swift, Curator of Ichthyology, was collecting fish specimens off the Pakistan coast, the available charter fishing boat had no compass, no night lights, broke a rudder on the mud flats, and stopped two thirds of the way to the Indian border because the captain was afraid of pirates.

On the way home from an expedition to the Galapagos to collect lava lizards and geckoes for genetic study, Herpetology Curator John Wright's ship caught fire, burned below the water line, and sank. A Mexican freighter picked up the survivors off Costa Rica, but Wright's unique collection was lost.

Sterling Keeley, research associate in botany, inadvertently cut open a wasp's nest while collecting her specialty, *Vernonia,* a shrub with purple, lavender, or white flowers. Its distribution and adaptations may shed light on the disputed geology of the Caribbean basin, continental drift, methods of plant divergence, and possibly cancer treatment. In Trinidad, a goat ate her prize specimen. In Guatemala she was confronted by teenage guerrillas with rifles.

The sunsets and the scenery may be unbeatable, but the climate, sometimes hostile people and dangerous animals, long hours, uncomfortable living conditions, red tape, and pressures of time and financing do not turn field work into a few weeks at a resort. So why do scientists make expeditions?

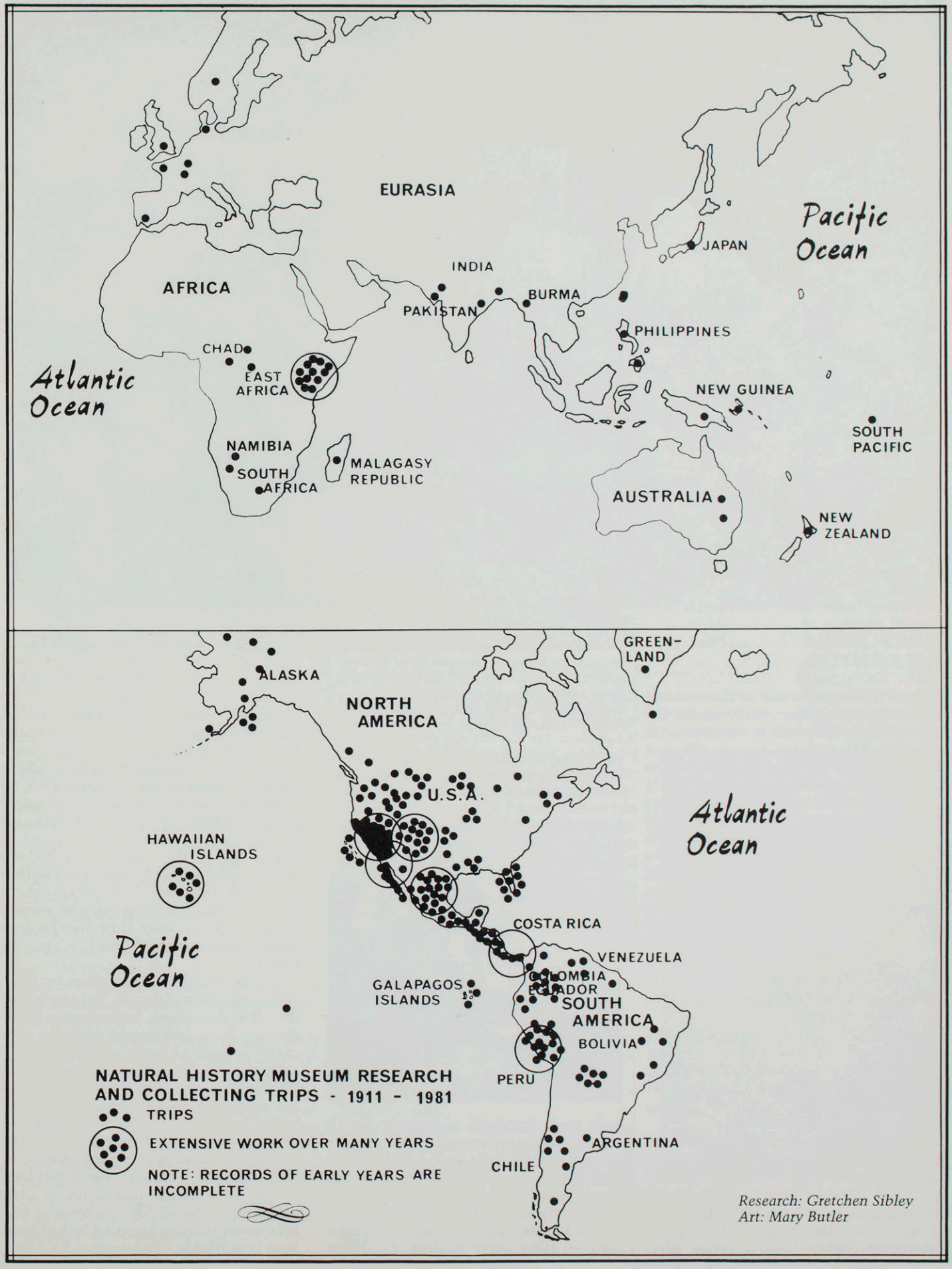
Common threads emerge from extensive conversations with twelve scientists about their expeditions, even though their specialties, methods, and destinations differ. First, they are all passionately devoted to their subjects. And, whatever the difficulties, they are utterly determined to accomplish their goal of adding to worldwide knowledge of their subject by publishing results, and enhancing the Museum's collections and public displays.

This last item is usually the only way the general public is made aware of the results of expeditions. Yet such results are often obscured for a time from public view by mountains of paperwork, thousands of specimens, and a time-money crunch preventing those who've been away from their desks for weeks from promptly curating what they've brought back.

TERRA here offers a taste of what life on an expedition is like, and what serious scientific stuff is involved.

FIELD TRIPS NEARBY

When curators go for a weekend or a few weeks to nearby sites, packing tents, sleeping bags, and some food in jeeps or trucks, they seem to prefer calling their journeys "field trips," though the motivation and goal are the same as for more distant or grandiose endeavors.



Research: Gretchen Sibley
Art: Mary Butler

EXPEDITIONS

INVERTEBRATE PALEONTOLOGY

Museum paleontologist Edward Wilson, assisted by Museum registrar Myra Hester, collecting Pleistocene age (100,000 year old) fossil seashells on an expedition to Santa Barbara Island, California in August 1975. Photo: Katharine Wagner.

Edward Wilson, Curator of Invertebrate Paleontology, has been studying the distribution of fossil corals in western North America. He explains that in the late Paleozoic (225 million years B.P.), many kinds of corals became extinct, and early in the Mesozoic Era (200 million years B.P.), modern corals developed, probably from some kind of sea anemone. Scientists have been working for two centuries to find a possible link between these corals.

Fossil corals of the Paleozoic Era like those in California are found through our West, up into British Columbia and Alaska, across Greenland into what is now Russia. Corals mostly occur today in warm, clear seas, and the fossil corals inform us where and when such conditions occurred in the past.

In California, Dr. Wilson explores the sequence of fossil faunas of the Permian Period, found in northern California. He described the McCloud Limestone at Shasta Lake as being "full of astounding fossils, including corals."

When Ed Wilson goes into the field, he may take along one associate, cots, Coleman stove, a tent, food. Every seventh day he trucks into the nearest town "to do laundry and get an ice cream." The work is lonely: climbing ridges, making measurements, digging fossils, lugging what

Phil Owen, curatorial assistant, Invertebrate Paleontology Section, collecting fossils in the McCloud Limestone south of Mt. Shasta, Ca.

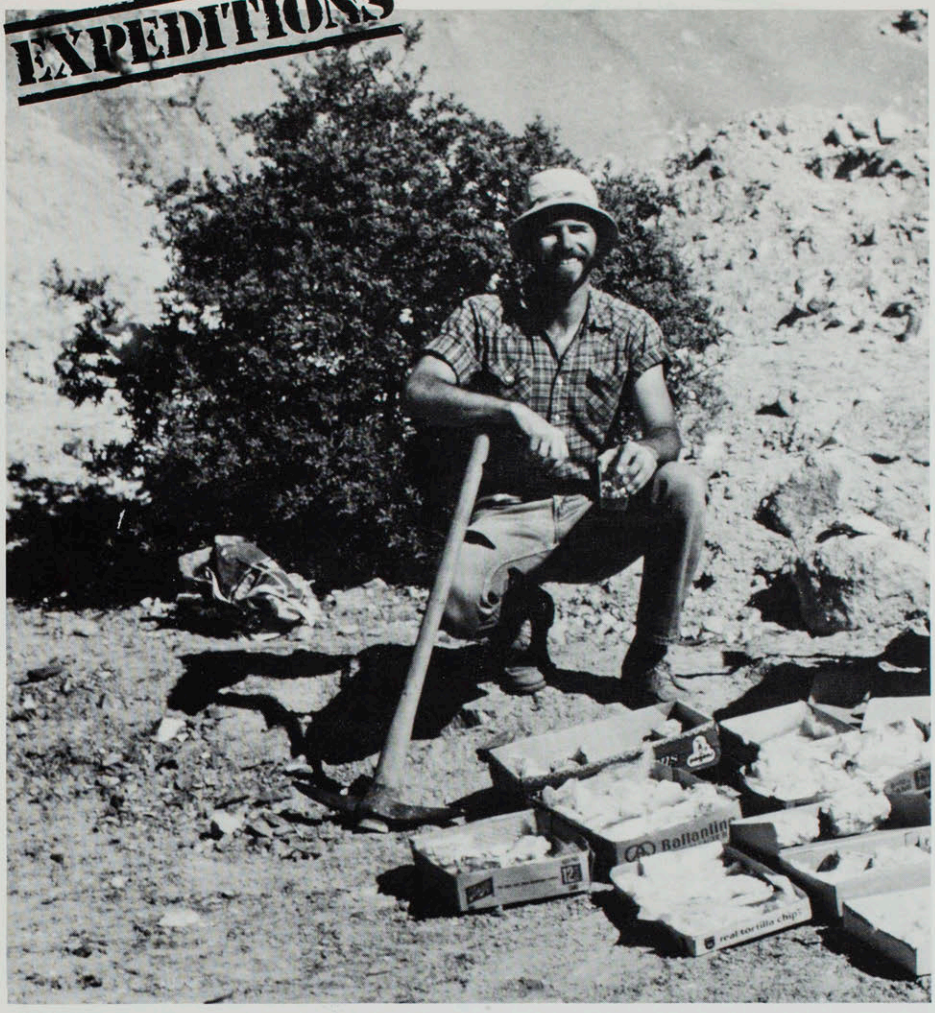
ends up as hundreds of pounds of rock back to camp over rough terrain in the heat. He labels each rock having likely fossils with tape on which he pencils numbers and letters, and in his notebook records where they were collected.

Wilson tries to see that whatever associate is along stays healthy. Breakfast: orange juice and oatmeal. Lunch in the field: meat like Spam, pickles, two oranges, V-8 juice, canteens with plenty of water. Dinner in camp.

Hazards? Heat, fatigue, falls, reptiles. Only twice has someone killed a snake on one of Wilson's trips. There was a rattlesnake in northern Nevada which came out from under the same rock by camp every day and just waited for something to wander by to eat. A Russian assistant born in Shanghai and raised in Brazil killed the snake, and Wilson "didn't speak to Igor for ten days." Wilson deals with camp rattlers by picking them up behind the head and carrying them a mile or so from camp. How does he drop them without being bitten? "Carefully. Quickly."

Outstanding fossil specimens are often exhibited at the Museum, but as with all the other disciplines, lack of space sends thousands of fascinating samples into carefully labelled boxes and drawers.

Passion for his subject surfaces as Dr. Wilson displays a slice of fossil. "Protozoans somewhat like amoebas are the best 'index fossils' in the world—abundant, worldwide, rapidly changing. That's why blue-green algae aren't good index fossils—they don't change much. But look at this *fusulinid*. It looked like a little golf ball. It moved like an amoeba in a gelatinous fashion, trapping bits of food. Very beautiful in cross-section."



Dr. Kampf collecting artinite in San Bonita, Ca.

MINERALOGY

Tony Kampf, Curator of Mineralogy, has been with the Museum for five years. During that time much of his field work has been in California, in remote areas where there are minerals found nowhere else in the world. He camps out, and uses mostly hand tools to extract specimens, which he wraps in newspaper and packs in beer flats. "The rocks often don't look like much till I get them home and clean them up."

Dr. Kampf often explores old mining areas, although miners and collectors cleaned out most quality specimens long ago. He explains that chances of finding display-quality minerals in the field are pretty slim, so museums these days often buy or trade specimens.

Knowing where to look for minerals is half the battle. There is gold in a newly-dug area in the midst of 1870's mines near Mariposa. There are pegmatites in San Diego County which yield fine gem crystals if you're lucky. Just north of Bishop, in the White Mountains, there are rare phosphate minerals and rutile. Kampf has explored an old mine in that area (where he once became perilously stuck halfway up a talus slope), and is pleased that for once mine buildings have not been vandalized and even still contain beds.

Kampf acknowledges some of the hazards of field collecting. In old mines possible cave-ins are always a concern. Even in the open, rock slides cannot be dismissed. One collecting area in San Benito County even has signs posted warning of asbestos dust. A hazard Kampf has come to anticipate is rattlesnakes. These Kampf has "nearly stepped on" in the Black Hills, the Grand Canyon, and San Diego County, thus far without mishap.

Sometimes the different disciplines combine forces on field trips. Kampf has accompanied Ed Wilson to Santa Rosalia in Baja, California; while Wilson hunted fossils, Kampf searched for an unusual copper mineral called boleite which appears as small dark blue cubes. These cubes were rare in collections until an old mine in the Boleo copper district was redeveloped and so many cubes were found that the bottom fell out of the boleite market, from hundreds of dollars to a few dollars a cube.

Dr. Kampf revels in the sense of discovery, both in the field and in the laboratory. "Finding an unusual specimen in the field is only the first small step; then you must bring it back to the lab and learn all you can about it." It is easy to understand why one of his specialties is describing new minerals.

EXPEDITIONS

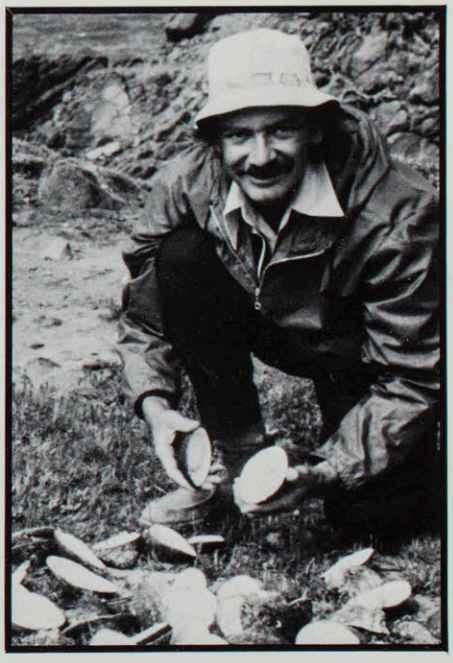
EXPEDITIONS FARTHER AFIELD

MALACOLOGY

Curator James McLean has searched Californian, Mexican, and South American waters for "the best specimens," alive or dead, to fill in gaps in the Museum's shell collection. When possible he scuba dives from yachts or charter boats around islands which provide a lee side without wind, where there's "deep water with a rocky bottom and lots of kelp." He dives with big muslin sacks made by Museum volunteers. He fills the sacks with sand and gravel from the bottom, carries buckets of specimens off the boat, and sieves the material on screens he always packs in his suitcase. "I've prepared specimens in bathtubs in many a hotel!" Each load from the sea floor contains hundreds of species, less than half of which are large enough to see before sieving with quarter-inch mesh.

The expedition that meant the most to Dr. McLean was two months in 1975 in Chile with an eminent marine ecologist from the University of Washington, Bob Paine, and three graduate students. McLean was asked to go along to make on-the-spot identification of mollusks for an ecology study. He received National Science Foundation support for some of the cost, and paid the difference himself.

The Chilean coastline, which covers as many miles as from Acapulco, Mexico, to Southern Alaska, has numerous rocky, inaccessible areas rich in shell life rarely



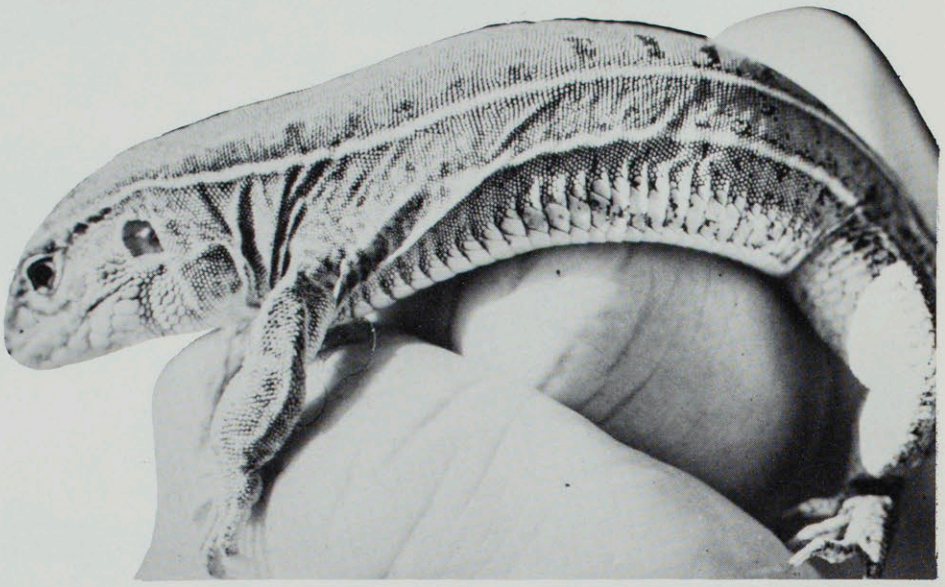
Curator McLean examines five different species of the keyhole limpet Fissurella found in these shells left by fishermen at Los Molles, Aconcagua Province, Chile.

exhibited in museums. The shoreline trip extended from the north to the south of Chile, covering four low-tide periods. Between the periods of low tides, the group travelled to different localities. During each low-tide period they covered two areas, camping out or staying in marine laboratories or hotels. In each area, McLean collected, and made identifications, while Paine and his assistants set up experiments in community ecology, installing cages on rocks to see how algae, barnacles, and mussels can settle and grow without predators getting at them.

McLean soaked the samples he collected in alcohol or formalin, laid them out to dry, sacked them, and sent them back to the Museum by air freight. Some were as small as one millimeter; others were so large he took only twelve of each kind. The different locales had a maximum of one hundred species each, much less than a tropical coast.

McLean particularly wanted to collect samples of the keyhole limpet *Fissurella*. Thirteen different species occur in Chile, all in the same area but in different habitats (surf, under rocks, or on the sides of sea walls). His purpose was to examine these limpets in the field and clarify their very confused taxonomy. (The Museum is about to publish his results.)

Shells not exhibited are stored in long, shallow drawers in the Malacology offices. "No, we don't clean out the insides," McLean says. "Once preserved in formalin and dried, the body can be rehydrated to study the anatomy."



HERPETOLOGY

Top: A teiid lizard, Teius teyou, *captured by Dr. John Wright in the Pampas of Argentina.*

Bottom: Dr. John Wright with a portable lizard "corral" near Rio Segundo, Argentina.

Curator John Wright maintains vials of reptilian tissue samples in a tank of liquid nitrogen. He collects reptiles and their tissues to pursue research into evolutionary genetics. One of his major interests is the biogeography, evolution, and genetics of Galapagos lizards.

Dr. Wright also studies a lizard group that inhabits drier habitats of North and South America. This group includes about fifteen species that reproduce parthenogenetically (females reproduce without males). His research with this group is funded by the National Science Foundation. In collecting lizards for this research, he uses a portable corral into which he herds lizards. He puts them in damp cloth bags to transport them to the Museum.

At the conclusion of several South American expeditions, Dr. Wright carried live but dormant reptiles back in his luggage. "I always had collecting permits so the people at Customs weren't surprised when they opened my bags."

Top: Fish drying on roof of Institute of Marine Biology, Karachi, Pakistan. Dried fish were sent to NHMLAC to be skeletonized.

Inset: Loading ice on the shrimp trawler at the fish harbor, Karachi.

ICHTHYOLOGY

Curator Camm Swift spent two months collecting fish off the Pakistan coast in the winter and early spring of both 1978 and 1979. Archeologist George Dales of the Department of Near Eastern studies at U.C. Berkeley had excavated coastal areas in Pakistan, looking for pottery that might show a connection between the ancient civilizations of the Indus Valley, Persian Gulf, and Fertile Crescent. Dales found numerous ancient fish bones at inland sites that used to be near the ocean. In order to study these fishes, Dr. Swift wanted to collect and study recent fishes in the little-studied waters off Pakistan.

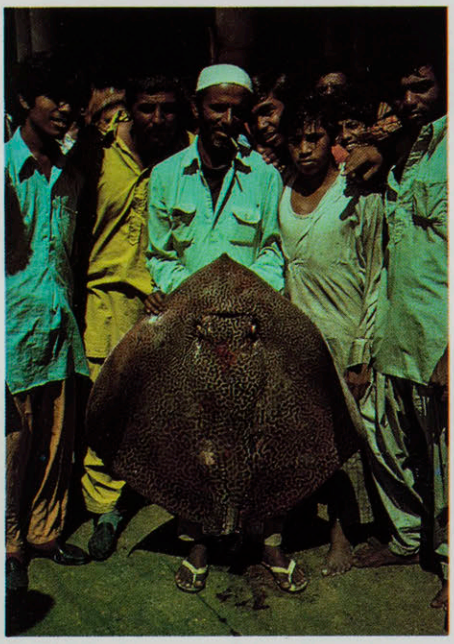
Dr. Dales and Dr. Swift applied for and received a grant from the Smithsonian Foreign Currency Program, and were funded to go to Pakistan in 1978 and 1979.

Swift and his associates worked with the University of Karachi, a graduate student going along with them for translation purposes. Just before boarding a shrimp trawler for two weeks' collecting, Swift found out that none of the graduate students could go. So off Swift and his group set, with a British Admiralty chart for Pakistan that the boat captain couldn't read. Pakistani fishermen, Swift explains, are familiar with the local streams of the vast mangrove swamps around Karachi, where they set nets in waters that vary from fresh to brackish to marine. The cook served up excellent fresh fish with peppers and *chapatis* (flat wheat pancakes). The captain shared his drink: a big bowl of white fluid full of lumps which turned out to be camel's milk with sugar and rice.

The coast was wild, beautiful, the fish plentiful and varied. The group netted thousands of fish, which were preserved in formalin and kept on ice until the boat returned to Karachi. There, the fish destined to become skeletons were taken to the roof of the research lab at the university, filletted, and dried in the sun, later to be brought to Los Angeles to be stripped clean of all flesh by the Museum's hard-working dermestid beetles. Other preserved fish were placed in fiberdrum containers and jars. The collection was augmented by fish from the local markets and from shrimp trawler nets.

After a few days of getting through official red tape, Swift received export permits to ship the dried fish home. The problem was, there's a big market for dried fish in Africa and Asia. Officials were sure Swift was trying to compete with Pakistan's export market, but once they realized he was shipping scientific specimens, permits were granted.

Some of the fishes Swift brought to the Museum are now on loan to the Smithsonian, the University of Michigan (minnows), Tel Aviv University, the British Museum, and Australia.



Top: Trawl catch being dumped on the deck of a trawler in the northern Arabian Sea.

Center: Pakistani fishermen holding a big stingray at Karachi fish market.

Right: Life aboard a small shrimp trawler off the delta of the Indus River south of Karachi.

EXPEDITIONS

ORNITHOLOGY

Curator Ralph Schreiber experienced no blockade in shipping specimens home from his recent five-week expedition to Corrientes, a cattle-grazing, rice-growing province of North Argentina with huge *estancias* of 20,000 to 80,000 acres.

The expedition, funded by Mr. and Mrs. Tom Duque and Mr. and Mrs. Don Kennedy of Santa Ana, who are active Museum supporters and who accompanied the Schreibers, had been in the planning for three years.

Schreiber explains that Argentina cares about its wildlife. The head of the Department of the Interior asked the Schreibers' advice on agricultural pest species, like the monk-parakeet and pigeons, against which the army had ineffectively used flame-throwers.

Dr. and Mrs. Schreiber work as a team, accomplishing, they are sure, four times as much as if working alone or with assistants unaccustomed to scientific methods. Even so, lack of help is a problem.

The Schreibers collected specimens, with full data recorded on charts ready for scientific analysis. Where was the bird, and when? What was it doing, and with what other birds? General knowledge about birds is quite high, Schreiber says, when compared to what is known about the lives of insects or mollusks. But, after all, there are only 8,600 bird species in the world, compared to more than a million species of insects. There is much still to be learned about birds, though, especially in the taxonomic and behavior areas, which are the Schreibers' specialties. They are studying and collecting the egrets, herons, caracaras, and smaller birds like passerines that are found in the copses of oak, eucalyptus, and acacia dotting the pampas.

Working in the field is always difficult, with time at a premium. The Schreibers worked twelve to fourteen hours a day collecting 385 specimens of eighty-six species. They put out mist nets to catch the birds, and ended up with bats as well. They recorded everything possible about each bird, even what parasites were living on or in it. They weighed and examined bird crops, to find out what the birds were feeding on and when. In the afternoons, some pigeon crops had thirty grams of rice. The Schreibers measured gonads and ovaries to see if birds were in breeding season.

Written records completed, the Schreibers prepared each specimen. Birds destined to be skeletons were skinned, stripped down, dried, and then, back at the Museum, soaked in water for two months to finish cleaning the bones. Many of the birds were preserved as "alcoholics." First they were injected with formaldehyde to preserve the tissues; then they were stored in alcohol. In this way the whole carcass, organs, muscles, and all, is available for further study.

Ralph Schreiber skinning a rhea.

"Ornithology is our vocation and avocation," Schreiber says. "I was initially attracted to biology because of my desire to work with living things out-of-doors." And the living conditions on this expedition weren't bad. Winds often blew the omnipresent mosquitoes away in this malarial area, the Schreibers ran into only one *huge* snake, the cook occasionally acquiesced to their request for some fruit to go along with the usual meat and unwrapped rock-hard bread, and the water was potable.

EXPEDITIONS

Clockwise from upper right: The "moth with the crushed red velour racing stripe," Dinia aeagrus, *observed and collected during an Earthwatch expedition to Costa Rica.*

Saurita afflicta, *a ctenuchid moth attracted to withered* Eupatorium *flowers during an Earthwatch expedition to Costa Rica.*

An orchid bee, this one with an orchid pollen sac (pollinium) stuck to his back, photographed during an Earthwatch expedition to Costa Rica. These bees usually fly so high and so fast that baits must be used to bring them within reach of the net.

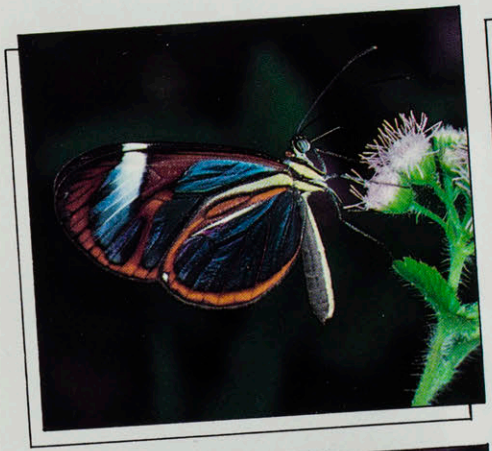
The brightly-colored diurnal arctiid moth, Belemnia inaurata, *on* Ageratum *flowers growing in a pasture that once used to be rain forest. Photographed and collected during an Earthwatch expedition to Costa Rica.*

An ithomiid butterfly, Mechanitis isthmia isthmia, *on* Ageratum *flowers growing in a pasture that once used to be rain forest. Photographed and collected during an Earthwatch expedition to Costa Rica.*

An ithomiid butterfly, Ithomia patilla patilla, *on* Ageratum *flowers growing in a pasture that once used to be rain forest. Photographed and collected during an Earthwatch expedition to Costa Rica.*

The rare (in Costa Rica) yellow form of the eyelash, or tree viper, Bothrops schlegelii, *found in a hollow tree that was cut down as a safety precaution.*

Photos: Julian Donahue



ENTOMOLOGY

Which was not the case on Assistant Curator of Entomology Julian Donahue's 1979 expedition to Costa Rica to collect tropical insects (accompanied by two other Museum curators: Chris Davidson, to collect plants, and Bob Bezy, to collect reptiles and amphibians, and to work on the curious puzzle of parthenogenetic lizards—females that can reproduce in the absence of males).

The journey was funded by the Museum Foundation and by Earthwatch, a Massachusetts organization that matches paying volunteers with an appropriate field research project. Kathy Donahue, Museum Librarian, described how her husband organized and fielded this expedition, which included her as one of the eleven volunteers whose task it was to aid in collecting specimens from the disappearing tropical rain forest.

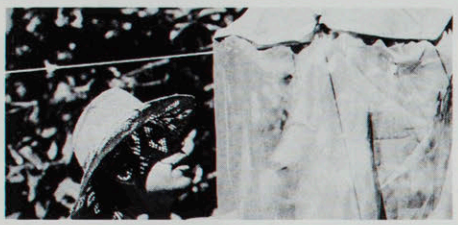
The fourteen team members stayed on a cattle ranch on the edge of the forest in three houses. Abandoned for only a year, these well-constructed houses had already suffered severe damage from termites, one of the first stages in the pervasive rot and decay of the jungle. The volunteers repaired the floor of the building chosen to be the lab, with added plastic screen to keep out unwanted visitors. Still, mosquitoes, bats, scorpions and other intruders from time to time managed to add a spark of excitement to the domestic routine.

Using only a wood-burning stove, the ranch cook served rice and beans at every meal, augmented with eggs, bread, tuna, noodles, salad, or fresh meat. She outdid herself for the victory feast at the end of three weeks of work, and prepared two local delicacies: palm hearts and *tepescuintle,* a large burrowing rodent also known as an agouti, with rich flesh akin to a cross between pork and chicken.

The insect collectors used a variety of traps, in addition to the usual net-in-hand technique, to obtain some 56,000 specimens for the Museum's research collection. Botanist Davidson and his crew collected over 1,800 plant specimens, representing more than 700

species, some of which are new to science. Bezy and his helpers not only found a few more pieces to help solve his lizard puzzle, but also collected a number of herptiles for the Museum collections.

The work was hot, wet, itchy, hard, and gratifying. For the Earthwatch volunteers, it was an unforgettably satisfying experience, the likes of which become increasingly difficult as the world's rain forests disappear at an ever-alarming rate. For the three Museum scientists, it was a unique opportunity to work with intelligent and talented volunteers to salvage information from an endangered habitat.



Top to bottom:
Earthwatch volunteer and optometrist Dr. Chris Hair inspecting a butterfly bait trap in a Costa Rican rain forest.

What once used to be virgin rain forest is now grazing land, providing inexpensive lean beef for North American fast-food chains in what is being called "The Hamburger Connection."

Earthwatch volunteers and Museum scientists were racing the logging equipment, to obtain specimens before they were extirpated by the destruction of the Costa Rican forest.

Sawmill waste and river silt are used to build corduroy roads to slash through the virgin forests, opening them up to squatters, developers, and opportunists. Here Earthwatch volunteer Chip Lewis trudges campward after a strenuous day of collecting.

EXPEDITIONS

BOTANY

The reduction of the New World tropics has affected Sterling Keeley's study of *Vernonia*, in that on some expeditions she may travel hundreds of miles without finding specimens. Dr. Keeley, research associate in botany at the Museum and assistant professor of biology at Whittier College, does work with chaparral plants as well, but her primary research and publication are in the genus *Vernonia* (Family Compositae), a member of the sunflower family.

With a grant from the National Science Foundation administered by the Museum Foundation, Keeley travels through the damp, hot tropics looking for specimens of the more than one thousand *Vernonia* species mostly found in the New World tropics; her interest is in those of the Caribbean basin. Keeley is studying the taxonomy, distribution, and ecology of *Vernonia* to reconstruct the history of the spread of the genus north from South America. Perhaps the plant originated in Brazil (part of the ancient continent Gondwanaland) and spread north to Central America and the United States.

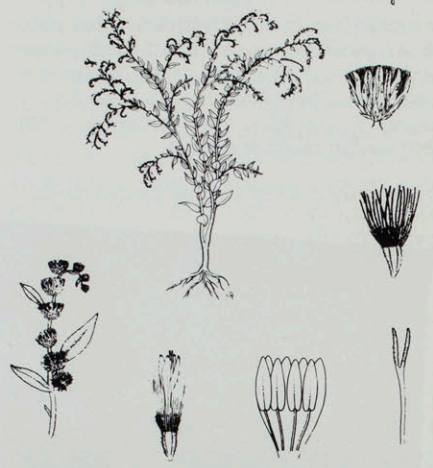
Vernonia is found in a wide variety of habitats in the New World. In the United States, it grows in the humid Southeast, from Texas to Florida, but also north to Maine. In the Caribbean and Central America *Vernonia* species are found from sea-level to 10,000 feet, on volcanic, serpentine, or bauxitic soils, and from dry rain shadows to dense, moist forests. The distribution of species varies. One species occurs only on a single limestone pinnacle, and another on two, in Jamaica; other species are more widely spread. In Guatemala Keeley found the same species occurring also in the West Indies and Colombia, a fact not previously recorded.

Dr. Keeley says that some *Vernonia* contain bitter components, sesquiterpenelactones, a group of secondary plant products found in the leaves which might have evolved as anti-herbivore repellants. The plants can also be gummy and hairy. And one species produces a tumor inhibitor.

What produced these similarities and differences? In her study of factors resulting in radiation of a species, Keeley thinks that some *Vernonia* lines gave rise to distinct and highly specialized new species, while other lines adapted well to new habitats through morphological variation. These latter species are now widespread in the Caribbean basin.

The radiation of *Vernonia* and other large genera from South America depended on getting through the bottleneck formed by the narrow isthmus of Panama and other barriers created by the changing geography of Central America and the West Indies. How did *Vernonia* manage it? The interrelationships of *Vernonia* species may shed some light on the disputed geology of the Caribbean.

Collecting *Vernonia* is tough. Ants and wasps make nests in *Vernonia* flowerheads or along stems. Scaling cliff faces and mountains is made more difficult by stinging vines, nettles, thorns, and "cowitch" in Jamaica. On Keeley's last expedition, a fer-de-lance, a deadly tropical snake, surfaced out of the grass she was beating as she made her way toward a specimen. Sometimes she has to use a

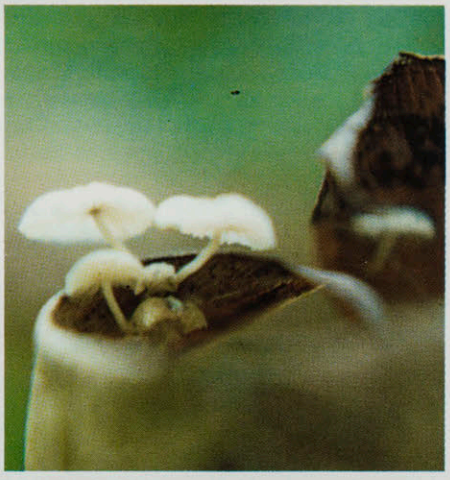


Top, left: Sterling Keeley with Vernonia scorpioides *in Trinidad.*

Top, right, and center: Vernonia arborescens, *inflorescences and leaf types, from drawing by Frances Runyan.*

Bottom: Vernonia *albicaulis ssp. "longistylis."*

Top: Botanists going out on transect in the mist on top of Haleakala Crater at 10,000 feet. This is about the fourth time the team has started its downhill transect by first climbing into the crater and then up the side to get to the upper flanks where the surveys are being done.



Center, left to right: Suillus granulatus, *a "bolete," familiar as an old friend commonly found in southern California under Monterey pine. Here found in Poli Poli Park on Haleakala, with pines, naturally.*

Marasmius *sp., one of the type of gilled fungus ubiquitous in Hawaii, and in tropical regions generally. Size of these tiny parasols indicated by their presence in a* Pandanus *stalk which is two inches across.*

Bottom, left to right: Xylaria hypoxylon, *an ascomycetous fungus, cosmopolitan in distribution, carbonaceous, and startling in a gloomy woods.*

Coriolus *sp., a nongilled, polyporous fungus, appearing in extremely variable growth habits, from fan-shaped, shelf-like, to rib-boned. Ornaments of the introduced trees areas along the Hana Road where guava, mango and eugenia were planted.*

machete to get through the vegetation. She has been aided in her collecting of treetop *Vernonias* by her husband, Dr. Jon Keeley, also a botanist.

After collecting specimens, Keeley records all details of the collecting locales, habitats, and date, and assigns each specimen a reference number. To preserve the specimens, she puts them between two sheets of newspapers and two blotters, then cardboards and wooden boards ("a specimen sandwich!"), and dries them with a portable hair dryer.

Once dried, specimens are packed for transport back home where the real work begins. Each specimen must be carefully measured and described. Pollen is taken from the flowers, cleaned, and examined with an electron microscope. Seeds collected in the field are planted in the greenhouse. The plants raised from these seeds are used in studies of the chromosomes, and are hybridized to test relationships between species.

Collecting occasionally involves unforeseen risks. In Jamaica a tear-gas bomb exploded under her car, causing a brief desertion of duties. In Guatemala a car and person search was undertaken by semiautomatic-rifle-toting teenage guards looking for contraband. Despite these problems, she is now eager to plan her next expedition, having returned from a summer's work in Australia and New Guinea.

Quite another type of expedition was undertaken by Florence Nishida when she joined a group of scientists in Maui on the fourth year of a long-term Hawaiian project of the United States Fish and Wildlife Survey (USFWS). The project, an island-by-island survey, is recording the presence and density of endangered plants and birds.

Ms. Nishida is a Museum research as-

sociate, a professional who, while not on the permanent Museum staff, does considerable work at the Museum with mutual benefit. She joined the Maui expedition because Dr. Don Reynolds, Curator of Botany, was aware of the project and asked the USFWS if they needed a mycologist.

The group stayed at a former prison in the Makawao area, sharing the camp with the Youth Conservation Corps. Nishida paid two dollars a night for her room.

Using a transect map of the island, the group started high on ridges and worked their way down. Surveyors went out first, tagging areas ("stations") with colored ribbons. Botanists stopped at each station to catalogue plants. Birders would "incidental"—stop and listen for bird songs. Each team took a topographical map, compass, and radio. There were radio checks at ten A.M. and four P.M., to be sure all were accounted for. The terrain is so wild it is easy to get lost or hurt. The previous year, for instance, one man fell 200 feet when he broke through the thin crust of a lava tube.

Nishida found fungi sparse, probably because the tropical forest decomposes so fast that debris for fungi to grow on is thin. Macrofungi in the Hawaiian Islands generally grow on dead wood, especially "exotics," plants such as pines, mango, and papaya. These fungi were probably introduced with the dirt around the imported plants' roots. Yet there are mushrooms endemic to the Islands, such as those growing on the *Acacia koa*. And a gelatinous, fan-shaped, veined, pale green, translucent mushroom grows on the "ohia" and other native woods.

One's instincts prevail, even in a habitat as different from Southern California as Maui. Even though she knew there are no snakes on the Islands, Nishida kept thinking about rattlers as she poked around in the thick vegetation.

Tropical plants, unlike chaparral plants, seemed "very soft" to her, perhaps because they never had to evolve tough defenses against herbivores, which were never endemic to Hawaii, nor did they need to survive drought periods.

Nishida discovered previously unknown species of mushrooms, and is working up her list for the University of Hawaii and the USFWS.

The expedition was highly rewarding in all aspects. Working together with scientists in various fields was enriching. "One of the pleasures of an expedition is that you get people and points of view together. We talked about pressures of environment, the influence of feral animals..."

Nishida had to return to Los Angeles as the expedition was about to leave for Molokai, to an area not studied for fifty years. When she left, her companions were brushing out all their equipment thoroughly, so as not to introduce exotics to the wildest of the Islands.

EXPEDITIONS

MAMMALOGY

Introduced social customs and modern technology are rapidly effacing the lives of Eskimos whom Dr. Don Patten, Curator of Mammalogy, studied to make a documentary film of their dependency on marine mammals. Patten, whose specialties range from tropical bats to whales, spent two months in northwest Greenland, in Inglefield Fjord, on an expedition sponsored by the late Maurice Machris, longtime Museum benefactor.

The Inglefield Eskimos are protected by the governments of Denmark and Greenland, which hope to preserve their culture, including their hunting patterns. These Eskimos still take dog teams to find polar bear, walrus, and seals in the winter. In summer, they hunt narwhals and beluga whales, storing the meat from kills in shallow graves topped by rocks. Forty or fifty narwhals are taken during the short summer; excess meat is cached for consumption throughout the autumn and long winter. (The Danish throne is composed of narwhal tusks.)

Dr. Patten and his co-workers, Dr. Floyd Durham and Kevin Duffy, helicoptered in from Thule. When they left, they took the yearly supply boat back out. They lived in a one-room plywood "cabin" now common to the village, although there are still a few Eskimo houses of the original type left, dug into the tundra with whale ribs for support and sod on top. The village of thirty adults and their children was sixty miles from the next village, with which they made occasional radio contact. The villagers still wore polar bear trousers and seal skins, using tendons for thread; their shoes were made of double layers of seal skin which swell when wet, thus sealing the seams.

Wood being scarce, the Eskimos originally used seal and whale oil for lamps, heating, and cooking, although fuel oil stoves are a common concession to modern technology. Ivory from narwhals and walruses substitute for wood and metal in the preparation of various fit-

tings, the surplus going to Europe for the ivory trade. Patten ate seal and narwhal meat (he says it is like lean beef, only black), some fish, eider duck eggs, cheese, and Irish bread (flour, baking soda, and water cooked in the frying pan). "It was austere," he comments.

By mid-July, spring hadn't arrived, and the fjord was still frozen. Then, as the ice began to break up, plants leafed, flowered, and quickly seeded. But more important to the Eskimos, the narwhals returned to the fjord.

There are perhaps 12,000 to 15,000 narwhals, of which a few hundred are taken each summer by the Eskimos of eastern Canada and northwest Greenland. In the Inglefield District, the Eskimos themselves have adopted regulations to ensure that the narwhals are hunted and taken only by strictly traditional methods and weapons. Sitting in his handmade, sealskin-covered kayak, the hunter patiently waits to intercept the narwhal as it swims by. If the hunter is accurate, the hand-thrown harpoon hits its target. A sealskin float and drag are attached by a leather line to the harpoon head, thereby ensuring that the narwhal can be pursued and the carcass recovered. Following the initial strike, all the hunters in the immediate vicinity cooperate to quickly dispatch the narwhal. The utilization of the animal is complete, the sledge dogs receiving the last few scraps and otherwise unusable portions.

Yet new social patterns may well change these ancient hunting methods. It used to be that Eskimo girls sought a "broad hand" for a husband, that is, a good hunter who could provide for more than just his own family. But now most of the girls prefer a man from a larger town, or one from Denmark, who has had some formal education and can obtain a better-paying job. So there is motivation for young Eskimos to move away and join more commercial hunting ventures, rather than staying with a family or village-oriented life.

Patten hopes his documentary, now being reedited, will enliven interest in a dying culture and promote action on behalf of endangered marine mammals.

Left, top to bottom:
Group of male narwhals in water next to piece of floating ice. Note tusks and narwhals at surface, exhaling.

Hunter, with the harpoon positioned, ready to throw.

Dead male narwhal on beach, ready to be butchered. Note tusk.

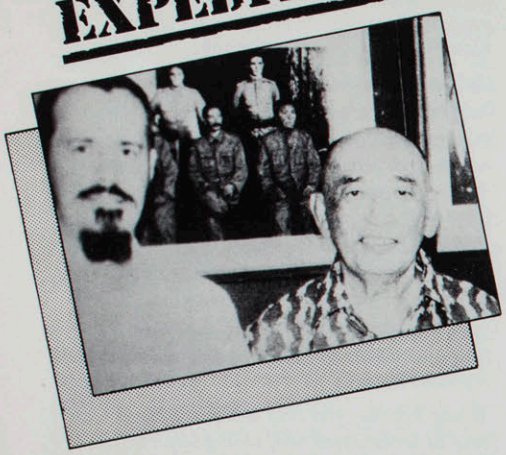
Center:
Young "broad-hand" in his kayak, waiting to intercept narwhal.

Right, top to bottom:
Don Patten (motor) and Kevin Duffy (photographer) in collapsible, modern kayak. (Cover Photo.)

Young Eskimo girl and her baby. Note mixture of traditional seal skin parka, with built-in hood for baby, and modern clothing for baby.

Sledge dogs, idle during the short summer.

Photos: Expedition personnel



Chaput with Jose Lukban, former head of the Philippine National Bureau of Investigation.
Chaput has written a series of articles on Jose's father, Vicente Lukban, one of the leading heroes of the Philippine Revolution.

HISTORY

Curator Don Chaput, who has pursued historical research in numerous libraries, museums, and archives of Europe, spent several months in the Philippines on a privately funded expedition to obtain more information about items in the Museum's collections, to plan a Museum exhibit on the Pacific Frontier, and to research his specialty, Philippine-American relations.

He visited mining zones and battle sites, including the new memorial north of Manila bedecked with both Philippine and Japanese flags commemorating the place where the first Japanese kamikazes took off. He travelled by train, car, helicopter, or boat from one part of Luzon to the other, and to Leyte and Samar. He interviewed hundreds of Filipinos, including high government officials, priests, fishermen, army veterans, and the extended family of a Philippine-American good friend.

To get from the south to the north end of Samar, Chaput had to charter a boat, since at that time there was no road. The boat docked at numerous thatch and stilt barrios up and down the jungle coast, where residents gave him a consistently friendly reception. Friendliness sometimes even hampered his work, people trying so hard to please that historical objectivity became more difficult than usual.

At the Divine Word University in Leyte, Chaput helped in the organization of the papers of Senator Romualdez, uncle of the present First Lady of the Philippines, Mrs. Imelda Marcos.

Chaput's Philippine research and interviewing have resulted in more than ten articles published in historical journals, and he serves as consultant to *Leyte-Samar Studies.*

EXPEDITIONS

EXPEDITIONS ON VIEW

EXHIBITIONS

The public should be made aware of scientific discoveries, publications, meetings, and lectures emerging from Museum expeditions. Yet public pleasure in the result of expeditions is perhaps nowhere more evident than in Museum exhibitions such as habitat groups.

When Jim Olson, Head of Habitats, and museum associate Kevin Duffy went to the Congo and Zaire sponsored by the Logan Foundation to study and collect in habitats for the Lowland Gorilla and Okapi exhibits, the previously mentioned back-biting gorilla never showed up. This may be because gorillas are basically shy, and the pygmies may have been maligning them.

Olson's month in the Congo began with nine days in Brazzaville trying to convince officials to give him permits, because the Congolese couldn't believe anyone would want to go into the jungle to make molds of vegetation.

Eventually Olson and Duffy flew to Impfondo in the North Congo and stayed with Gene Thomas, an evangelical missionary who acted as a liaison with the locals about where to find gorillas. They boated sixty-five miles down the Ubangi River to Mombezele, where the whole village came to the river bank to meet them. Olson took Polaroids of the crowd, presented the Chief with his picture, and was rewarded with a monkey lunch at which a local woman presented him with gifts of chickens and bread. (Monkey is prepared by shooting, breaking joints, singeing hair, deviscerating, and boiling.)

From Mombezele Olson and Thomas went with pygmies in canoes five hours up a blackwater stream (Thomas barely missed stepping on a water viper when pushing out the dugout) to an old fishing camp. Then they slogged four hours through a swamp in thigh-deep mud. And they found gorilla nests (which all gorillas make fresh every night), but no gorillas. At that point, a pygmy told about a man bitten so badly on his skull by a gorilla that his eye hung out. Olson's bites, however, were from ants, mosquitoes, and spiders. He says he itched for a week.

Back at the missionary's, Olson and Duffy were told that a few years ago the minister's wife had been mildly bitten by a cobra near her bed, and that his daughter had been bitten by a horned viper in the front yard.

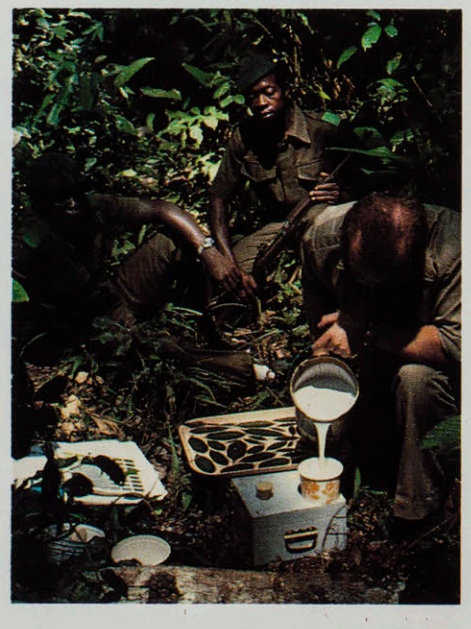
Driving a borrowed pick-up, Olson made molds of vegetation while Duffy collected butterflies for the gorilla exhibit and the Museum collection. Olson used silicone rubber for the leaf molds, both in the Congo and Zaire.

Every leaf, branch, bark, or bug in the Museum habitat groups is a scientifically-accurate replica of what is in the animals' habitat. Notice, for instance, the Bengal tiger display, for which Olson travelled to India.

Nowadays specimens of endangered species are never killed in their native habitat for museum purposes, but rather museums use animals which have died in zoos.

Back in Brazzaville, Olson and Duffy met numerous government officials who had been former students of the missionary in his mission school, and who were most eager to cooperate with the Museum in future scientific endeavors. Then Olson and Duffy were off to the Ituri Forest in Zaire to work on the Museum's Okapi exhibit.

"Everything worked on the African expedition," Olson says, relishing even the memory of crunchy fried caterpillars.



Page 18, left to right: Congolese hunters providing monkey for the day's lunch.

Olson pouring silicone rubber molds in Ituri Forest Zaire, assisted by two Zaire soldiers.

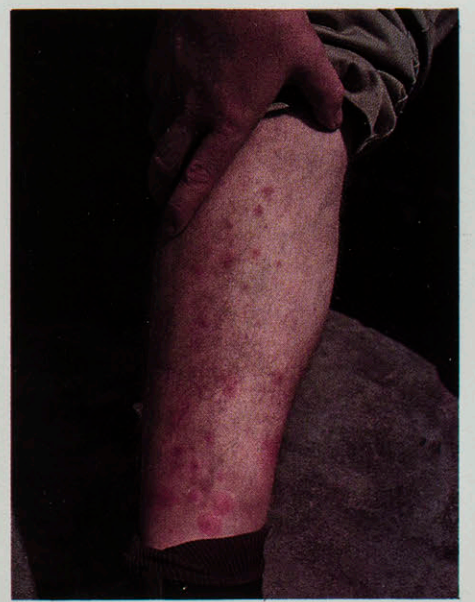
Page 19, clockwise from top: Pygmy family near Congo jungle work site.

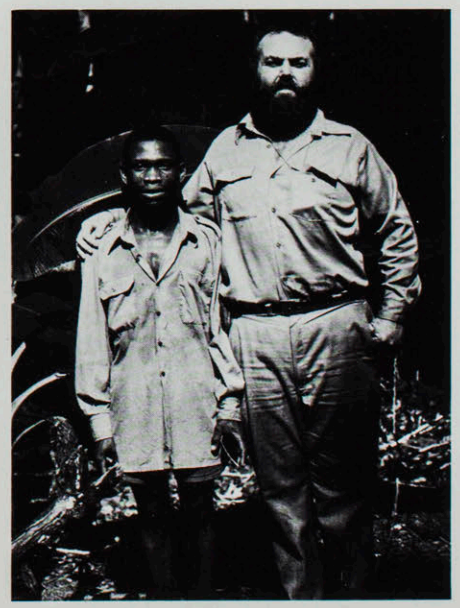
Olson at sign of Okapi capture station on Ituri Forest road.

Olson feeding an Okapi at the Okapi capture station, Epulu, Zaire. Arrangements for this were made by the Governor of the Haut-Zaire region.

Olson with pygmy friend and field assistant Mariane.

Olson's leg showing numerous bites after trek through swamp. His entire body was covered with bites after this trip.





"Everything worked." The energetic satisfaction in a mission accomplished evident in that statement is typical of our Museum scientists. Their many expeditions, illustrated on the accompanying map, are essential to the Museum's mission of exploring, preserving, educating, and serving. Furthering the Museum's mission is worth a lot of ant stings and monkey lunches.

Kilbee Brittain interviewed fifteen curators at the Museum to distill information for this article. Material she was unable to use now will be amplified upon later. Dr. Brittain is associate editor of TERRA.

ALONG FOR THE HAY RIDE

ON THE PROJECTO FLORA RIO TROMBETAS EXPEDITION, 1980

by DAVID M. MINOR

Photographs by the author except where noted.

When first asked to accompany the Natural History Museum of Los Angeles County team on a Brazilian botanical expedition, I pictured the stereotypes I had of that country mostly gleaned from reading and movies. Brazilia, with its innovative architecture came to mind, as did Rio de Janeiro with its alluring beaches and Sugar Loaf, imposing statue of Christ, undulating patterns on mosaic sidewalks, unrestrained festive carnival, mountains of coffee and Brazil nuts and, of course, Carmen Miranda and her horn-of-plenty hats.

Then someone mentioned the Amazon. Oh, *Northern* Brazil! One of the largest rivers in the world—a vast drainage system lined with swampy, tangled jungle, teeming with voracious vampiric piranha and monstrous, inner tube-like snakes, giant rope-webbing spiders and fierce head-hunting tribes of Stone Age Indians, lightly but effectively armed with feathered poisonous darts and blowguns. I began to have second thoughts about going.

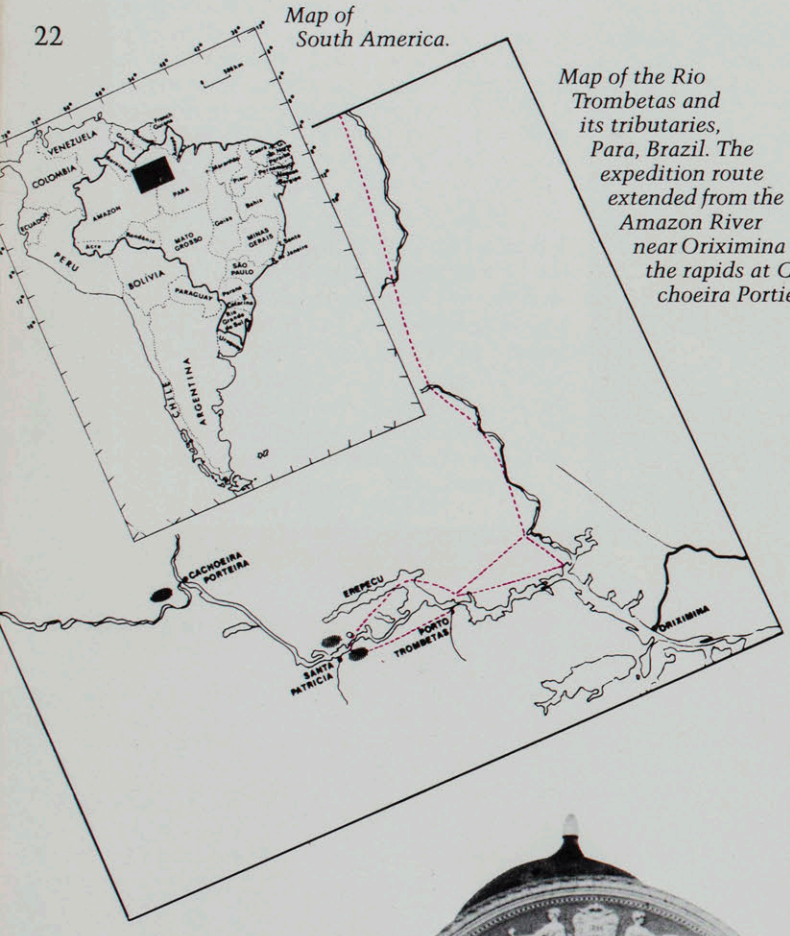
More enticing details were forthcoming. An overnight flight to Manaus was to be the first leg of the trip. (I wouldn't be flying down to Rio, but I had read about the famous ornate opera house in Manaus and had even seen an ad for the luxurious Hotel Tropical in *Saturday Review*, so how bad could the Amazon be?) A launch laden with supplies would leave Manaus for a cruise of several months—down the Amazon and then up a tributary called the Trombetas, the Trumpet River. Camps would be set up in little known places, some of which were just being opened to the outside world. I am a Research Associate in the Botany section at the Museum, and a professional writer/photographer. My job would be to write about and photograph the expedition and the service it would be providing.

History? Exploration? What exactly was an expedition going to do in Brazil in 1980 anyway? After questioning the botanists and reading some support material as background, I was then aware that recent years have seen an increase in scientific research in the tropics of Asia, Africa and the Americas. These remote areas—mostly still unknown in terms of flora, fauna, and geology—are being rapidly changed or at least being threatened with rapid change. The moist tropical forest of the Brazilian Amazon, for instance, is largely unexplored. Until recently this forest (an understated term) was looked upon by the powerful in Brazil as the main hindrance to Progress—the same kind of progress we sometimes bemoan in the United States when natural or even historic places are razed. This economic progress—development brought on by population expansion, logging, mining, farming and cattle ranching—has to eliminate the natural forest, either accidentally or on purpose.

The vegetation in these areas is the product of millions of years of evolution. It is a delicate and irreplaceable ecosystem. We don't yet know half of what makes it so, or what is there that could be of use to all humankind. It is fortunate that many in the military-dominated Brazilian government are coming to realize that eradication of the forests will create more lasting problems than any short term exploitation will solve. Therefore, the kind of expedition I was to join—to take inventory before the storehouse is razed—has been given high priority. Perhaps it is not too late to avert the complete disaster of increased deforestation and attendant desertification, erosion and changing climate.

Can a few botanists accomplish anything in a few months of snatching plants out of natural habitats and placing them in dried form in herbaria around the world? Time doesn't permit more than superficial sampling of that vast area containing great numbers of botanical species, but any step forward in our understanding of that unique tropical environment will be worthwhile. After all, new specimens are to be gathered for study in herbaria; new species will be discovered; and there will be a gradual chipping away at the frontier of botanical ignorance in the tropics.

Botanists look for specific types of plants, all the while being alert for new discoveries. Higher plant specialists find their work relatively easy, spotting flowers or fruits from a short distance, reaching or climbing to reach (usually by someone experienced in climbing) the desired branch, and then putting the specimen in a collecting bag to take back to home base for pressing, drying and classification. Mycologists, of course, often have to look more closely—either at the ground or at individual leaves for the fungi they seek. Mushrooms tend to dry up in a short time, so they have to be kept in small air-tight containers while delicate ones may be separated from others just to keep them more carefully intact. The fungi found on leaves and stems can be collected by gathering amounts of the leaves and stems into plastic bags for sorting and drying later. Whichever way the botanical collecting



Map of South America.

Map of the Rio Trombetas and its tributaries, Para, Brazil. The expedition route extended from the Amazon River near Oriximina to the rapids at Cachoeira Portiera.

Theatro Amazonas, the famous opera house in Manaus.

is done, the process where large numbers of specimens are accumulated is called and very nearly resembles "baling hay."

Baling this kind of hay is somewhat akin to a regular farm harvest of alfalfa or red clover. Just as the farmer rushes to get the hay into the barn before the weather turns, so the encroachment of "civilization" into the tropical forest makes the botanist rush to get his "hay" into his herbarial barn before it is gone for good.

Getting to the "hay fields" is, as might be expected, sometimes difficult. Planes, cars, trucks, boats and their pilots and drivers are hired to get the botanist into the field. Collecting plants or parts of plants becomes a sometimes facile, sometimes tedious job depending upon the time and place. Most of the time a machete and a plastic bag are all that are needed for a botanist to collect, but other things are critical when the sites are more exotic than the botanist's own backyard.

Take, for example, our experience in 1980. On May 17, botany curators from the Natural History Museum of Los Angeles County, Drs. Don R. Reynolds and Christopher Davidson, and I boarded the Varig night flight to Manaus. Dr. Reynolds, North American head of the expedition, is a mycologist, while Dr. Davidson specializes in flowering plants. They had applied and had been chosen to man part of the expedition maintained by Dr. Ghillean T. Prance of the New York Botanical Garden, and supported by a grant from the National Science Foundation. Dr. Prance's grant, titled "Projecto Flora," called for six expeditions during 1979–80, of which ours was number five.

Manaus was expedition headquarters because the host institution, Instituto Nacional de Pesquisas de Amazônica (INPA-National Institute of Amazonian Research), is located there. INPA would provide their physical facilities in Manaus, botanical field equipment, two field assistants and a field vehicle (jeep or launch) as its part of the expedition.

When we arrived, our designated launch was out—out for repairs. It had run aground on a "rock" in the Rio Negro and would be weeks in recovering. Its much smaller replacement, called the *Pyetá*, was then chosen, but because of a misunderstanding in bookings it was taken out by another party without word of a definite return. Lacking our principal mode of transport, we were stuck in Manaus.

On top of the major problem of getting the expedition off the ground (and into the water), we had to cope with much bureaucratic red tape, the heat and humidity, limited Portuguese and low morale.

Towards the end of the second week in Manaus, after the arrival of Brazilian botanists Vera Lucia Bononi of the Instituto de Botanica, in São Paulo, and Gustavo Martinelli of the Jardim Botanico do Rio de Janeiro, and after meetings with the Brazilian leader, Carlos A. Cid Ferreira (Cid), of INPA, a plan was hatched. Reynolds, Davidson, Bononi, Martinelli, and I would fly ahead to a town called Santarem with enough equipment to begin collecting, eventually setting up base camp on the Rio Trombetas at another town, Oriximina (x=sh). We five would be joined by the field assistants,

Top: Backwater of the Rio Negro, Manaus.

Left: The clear water of the Rio Tapajos near Santarem, Para, stays separate from the coffee and cream-colored Amazon for several miles because of the force of the Amazon's flow.

Right, above: Oriximina, Para, Brazil, with the Rio Trombetas in the background.

Below: Work table in Oriximina. L–R, Don Reynolds, Gustavo Martinelli.

Top, right: Don Reynolds and Vera Lucia Bononi heading for shore to bale hay.

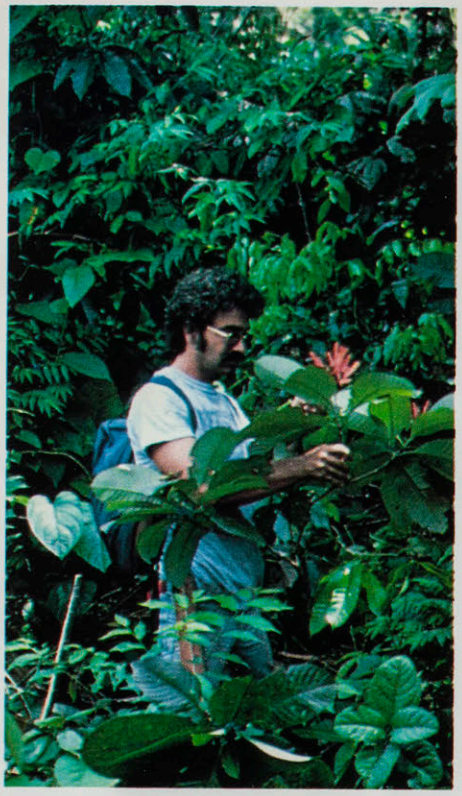
Inset: Bringing "hay" aboard. Don Reynolds, Vera Lucia Bononi and crewman.

Center: Chris Davidson, wading to collect water lilies.

Bottom: Easy collecting along the river—grabbing for Gustavia.

Page 25, top: Gustavia.

Bottom: Victoria regia—*the largest water lily in the world. (Photo: C. Davidson).*



Top: Chris Davidson with a specimen of Rubiaceae.

Bottom: A climber trimming a species in the Brazil nut family for the folks back at the herbaria. (Photo: P. Dunn).

Cosme Mota and Jose Ramos, some time within our first week in Oriximina. Eventually a launch would join us there, bringing the captain, his crew of two, a cook, Cid, an INPA plant product chemist, and Dr. Paul Dunn, a microbiologist with the U.S. Forest Service, Glendora, California.

Oriximina-based collecting began on June 3. Aside from a few limited excursions out of Manaus, this was the first real field work of the trip. The road—and there is only one main road since the river system is the primary "highway"—was the easiest way to explore what the jungle had to offer off the river, making this one reason we felt road building in the vast Brazilian forest justified. During the several days spent hiring guides and trucks, baling hay, having an Indian guide climb trees to cut branches, getting caught in the rain (no problem—a relief from the heat), almost becoming lost on foot in the dark jungle and wielding machetes to cut through the vegetataion, the mycologists, Reynolds and Bononi, completed their sampling of the available fungi. Furthermore, the rate at which the botanists collected the other plant specimens proved too rapid to be adequately coped with by the cumbersome plant drying machinery which ran on bottled butane. It was decided to split the group according to interests in order to cover more ground and to slow down the rate of collection so that the driers could catch up.

Reynolds, Bononi, Ramos and I went off in hired boats to explore the flood plain that lay across the main channel of the Trombetas from Oriximina. Meanwhile, Davidson, Martinelli and Mota hiked with a guide, a Brazil nut gatherer, who knew the trails through the forest. My group returned each evening to the generous accommodations and hotel food of Oriximina (beef, chicken, beans and rice—fish being too common to serve). The other group camped out for several days, roasting a small rodent for supper one night and seeing wildlife, such as red-haired monkeys, up close.

Despite our splitting up, the backlog of plants to be numbered and dried grew out

Inset: The promised launch, disabled in Minaus. To its immediate right is the tiny Pyeta.

of proportion to the driers' abilities to handle them. The launch from INPA, expected any day, would bring needed supplies, but our limited contact with INPA via radio-telephone didn't offer much hope of its ever leaving Manaus. Meanwhile, we ate at the few increasingly mediocre restaurants in town, wondering if the food would be better on the boat.

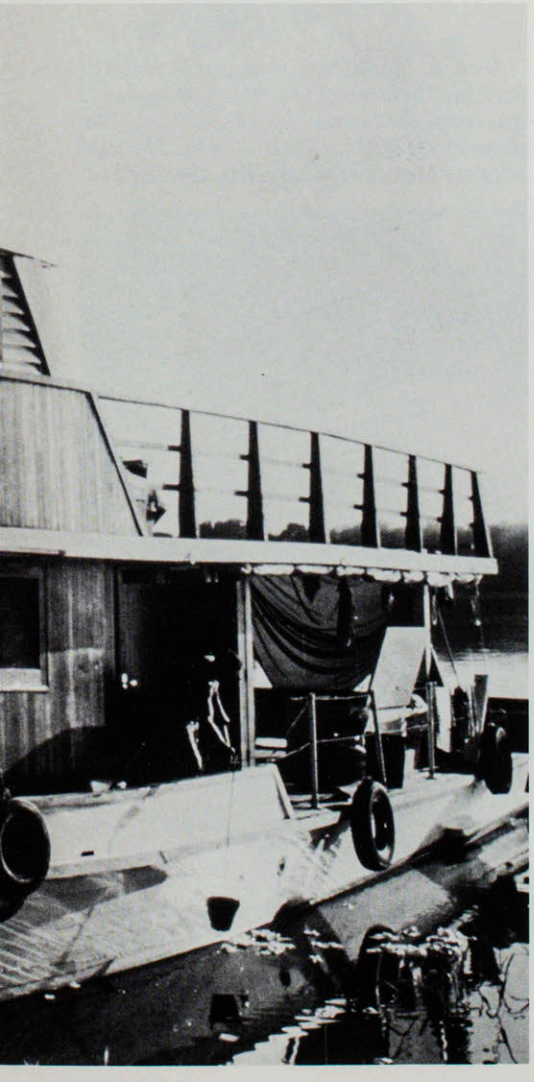
At last, on Friday, June 13, a launch called the *Ciência Amazônica* arrived at the docks of Oriximina. Instead of the small *Pyetá*, which had seemed not much larger than Bogart and Hepburn's *African Queen*, the *Ciência Amazônica* was double-decked, spacious and modern, equipped with a laboratory, shower, toilets, galley, two freezers, generator and diesel engines. The ichthyology section of INPA had loaned the botany section the *Ciência Amazônica*, which explained the tank in the hold amidship for keeping live fish (it was promptly drained when it was discovered we needed more room to stow all the plant specimens that had been collected during the previous two weeks).

After two days waiting for the backlog of plants to dry, we left Oriximina—on board a launch as promised—heading for the rapids of the Rio Trombetas. Sixteen of us, including a river pilot hired in Oriximina, found the cook's efforts with beef, chicken and fish excellent, the breezes lulling, the shoreline dense and mysterious, and morale increasingly high. The plan was to cruise directly to the rapids, collect for two weeks or so at a settlement called Cachoeira Porteira, and then head back down river to collect at places such as Porto Trombetas and Lago do Erepecu.

Going "directly" meant full-speed ahead against the current. The second morning out, most everyone was in good spirits, having just arisen in the misty morning light (except for Vera Bononi who slept late in her hammock), when suddenly the launch came to an abrupt halt. The three of us who had been on the top deck viewing the river bank during the sunrise were flung rudely to the fiberglass flooring, bouncing us (and a 300mm lens) against both the railing and a trunk stored under a tarpaulin. Bruised, battered and newly aware of being fully awake, we took stock of what had happened. Paul Dunn had almost pitched headlong over the bow, Antonio, the cook, got boiling water and most of the breakfast he was preparing slopped on him in the galley, and Cid had reeled against the sharp corner of an opened drawer in the lab—almost cracking his ribs. Vera in her crazily swinging hammock was the only one who had escaped body-to-boat contact.

While the crew cleaned up the few broken items and jettisoned them overboard, it was explained that the launch had run aground. The pilot hadn't known of the turtle breeding grounds in that section of the river which were exposed more than normally by the low water level this time of year. The captain did manage to back off the obstructing bar easily, and the boat remained afloat. But, proceeding at a much slower rate, the launch ran aground on the bar a second time. Fortunately, that time we were not caught too much off balance. The *Ciência Amazônica* also avoided damage again, but tempers flared with the realization that if it had sunk,

Below: The Ciência Amazônica, the launch finally used.



Above: Don Reynolds aboard the Ciência Amazônica sorting through his "hay." (Photo P. Dunn). Bottom: Don Reynolds avoiding the ever-present ants. (Photo: P. Dunn).

the real casualties would have been the specimens that had been gathered over the past two weeks.

On reaching Cachoeira Porteira, some scientists remained on board the launch to live in hammocks while others moved ashore to the semi-abandoned road-building camp, which turned out to be a veritable Eden with flat beds, private baths, a "supermarket," a small zoo and even a swimming pool near the cantina. There was plenty of room to spread out the equipment for processing plants and to set up a base from which to send out mini-expeditions either on a spur of the Transamazonian Highway or on the Rio Trombetas and its tributaries, the Rios Cachorro and Mapuera.

My participation in the expedition ended on June 21 when a private plane flew me back to Manaus. The others had continuing adventures and varying times of departure up until Don Reynolds and Paul Dunn exited on July 24. During the forty-nine or so actual collecting days, the group had amassed 30,000 specimens of flowering plants and fungi. (There were also 208 soil samples out of which Paul Dunn is hoping to isolate over 1,000 fungi, which will be studied for their practical applications in medicine and forestry.) The Natural History Museum of Los Angeles County has been the recipient of a portion of these specimens for safekeeping in the herbarium. Other herbaria benefiting from the expedition are the ones in São Paulo, Rio de Janeiro, Manaus, and the New York Botanical Garden, the Missouri Botanical Garden and all the institutions that have programs of exchange with these herbaria, including those in London and Paris.

Pressing Plants.

On looking back on my doubts and fears about going to Brazil, I can see now that they were largely unsupported by reality. The rivers were havens of relief from the heat. Because of the black water of the Trombetas, mosquitoes were virtually non-existent since their larvae don't like the high acidity in the water caused by rain passing through leaf mulch, therefy "brewing" a kind of "tea" with a high ph. Fresh water dolphins abounded, and egrets and kingfishers and many other birds were common. There were no signs of *piranha* or reptiles even where Davidson and Mota waded into the shallows to gather entire water lily plants. The whole experience lacked the kind of drama suggested to me by the name "Amazon."

Instead, the overall drama of the Amazon basin is more quietly evolving. According to such publications as *The Global 2000 Report to the President* (1980) and bulletins from the National Academy of Sciences, the "slash and burn," cleared areas I saw in the forest along the roads and spreading out from the towns are the portents of the end... an ending one can trace to attitudes even in Darwin's day:

> High above him Charles saw a huge bearded monkey hanging stiffly by its prehensile tail. A mulatto boy accompanying a young Brazilian had an ax with him. They started cutting down the enormous tree.
>
> "You cut down a whole tree to get a dead monkey?" Charles asked, round-eyed.
>
> "Why not? Too many trees; too much forest."
>
> The tree fell with a tremendous crash, tearing up the earth and breaking other trees on its way down.
>
> It was symbolic of Brazil's prodigal abundance.
>
> *The Origin*, (p. 195)
> by Irving Stone

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Two Brazilian helpers, Cosme and Jose, collecting the Podostemaceae. (Photo: C. Davidson).

Aloha holding bat
The large Brazilian bats were especially annoying, squealing and clinging with sharp scratchy claws to the underside of Aloha's string hammock.

Aloha waving in front of the hydroplane
Before her flight into the Brazilian jungle, Aloha was advised to use black dye to mask her conspicuous blonde curls.

Flight to the Stone Age Bororos

or There's a Willowy Blonde in the Museum Film Vault

by DAWN HATTENBACH

(Editor's note: The film, "Flight to the Stone Age Bororos," has been donated to the Museum. Made in 1930, it is the earliest film record of the *Bororos*, a Stone Age tribe in Brazil, and serves as an important anthropological resource. In a departure from the usual museum scientific expedition the following account provides a glimpse into the life of a woman adventurer during the 20's and 30's. The careful observations of this woman and her filmed account now provide us with a record of another culture.)

In the 1920's and 1930's the filmed adventures of Aloha Baker riveted the attention of audiences around the world. In a personal appearance at the Palace Cinema in Cairo, she shared billing with the Gish Sisters and Joseph Schildkraut's "Orphan of the Storm," and in the United States a star-studded Hollywood welcome was headed by America's sweethearts Mary Pickford and Douglas Fairbanks.

How did it all begin? In a secluded convent in France, a Canadian-American teenager pursued her studies—while secretly yearning for great adventure, world travel, perhaps a career as a glamorous motion picture actress. The difference between Aloha Baker and most young girls of the 1920's, or any other decade, is that she made her dreams come true. At the age of fifteen, after wheedling permission from her mother, Aloha accepted a position with a film expedition working its way through Europe on a round-the-world odyssey. Aloha's principal qualification for the job was her ability to speak French; her mother's main stipulation was that young Aloha be accompanied on the trip by a female companion.

As the group traveled through France, its progress expedited by Aloha's linguistic capability, films made earlier in the United States and the British Isles were shown to enthusiastic French audiences. At the same time, French adventures were filmed for showing in the next country to be visited. Thus the company planned to leap-frog its way around the world. Aloha, gifted with curly blonde hair, an infectious smile and a flair for drama, embarked on a multi-faceted career: translator, actress, camerawoman, driver, seamstress, laundress, and any other chores that might be assigned by the leader of the expedition, described by Aloha as a vegetarian and an absolute tyrant.

As the company toured from France through Italy, Spain, Germany, India, China, Japan and beyond, Aloha learned the language of many countries and continued to serve as the voice of the expedition. She also learned to climb in and out of a doorless car with no running board, to tolerate the stares of locals aghast at the sight of a woman in pants, and to adjust to sometimes primitive, even dangerous, living conditions. Facilities were few and far between, and the small troop's leader reserved the power to determine where all stops should be made. Feminine needs or discomforts were simply ignored. Memories of Aloha's early travels include a chance encounter with Mussolini in a narrow Rome street, a moonlit Egyptian night camping out next to the Sphinx, and a frigid winter walk to a Siberian bathhouse.

Endorsement advertising brought in additional revenues on the trek, and the travelers bartered with local merchants for goods and services in exchange for

publicity and theater performances. The expedition contracted with Ford dealers along the route to service their 1917 stripped-down custom-body T's. When the expedition returned in triumph to the United States, Detroit honored their achievement with a massive car parade, and Mr. Henry Ford in person congratulated them on meeting more Ford dealers than anyone else in the world—even "Old Henry."

How does one follow such a splendid first act? Aloha married the leader of the expedition, bore two children, trekked through Africa and in 1930 embarked on a new adventure which was to surpass even her earlier achievements. The third filmed chapter in the life of Aloha Baker, entitled "Flight to the Stone Age Bororos," has been donated by Mrs. Baker to the Natural History Museum of Los Angeles County and offers valuable resource material to anthropologists—as well as nostalgic adventure to historians and travelers.

Leaving their children with Aloha's mother, the couple planned a relaxing pleasure trip to Rio de Janeiro. Prior to the journey, at the urging of her friends and contemporaries Amelia Earhart and Colonel Arthur Goebel of TransPac fame, Aloha learned to pilot an airplane, a skill that was to prove both useful and life-threatening.

After thirty-two days at sea on the freighter SS Lorraine Cross, Aloha and company steamed into Rio's Botafogo Bay. Motion picture footage shows a smiling and waving Aloha standing atop the hood of her hoisted, swinging automobile as it was unloaded from the deck of the freighter. A careless act of bravado? "No," says Aloha, "my riding on the hood increased the chances that the local stevedores would handle our precious machine more respectfully."

An encounter with the Brazilian press, complicated by the intricacies of the Portuguese language, led to wild rumors that Aloha's true purpose in Brazil was to launch an aerial mission into the great Brazilian jungle to discover the whereabouts of missing explorer Colonel Perry H. Fawcett and his party, reported to have gone into the Brazilian wilderness in 1925 to search for a lost city—or possibly to search for gold.

Intrigued by stories of Colonel Fawcett's disappearance and by tales of Indian tribes in the uncharted interior, and buoyed and propelled by the enthusiasm of the Brazilian press, Aloha and her party abandoned their vacation plans and seriously began to consider a trip beyond the conventions of civilization into the unexplored Mato Grosso, the heart of the South American jungle.

The interior regions of Brazil, even today largely unexplored, were under the jurisdiction of the Brazilian War Department, and complicated negotiations were begun to secure the information and assistance necessary for this "noble and daring humane gesture on the part of a feminine film maker."

Aloha and her party were briefed by General Candido Mariano da Silva Rondon, an eminent Brazilian explorer and authority on customs and languages of the interior Indian tribes. "We should not have come out of the jungle alive," says Aloha, "had it not been for the General's expert advice and patient counseling." Most importantly, Aloha secured the use of a pontoon-equipped Junkers airplane, an all-metal, open-cockpit four-seater with a range of about 600 miles and a maximum speed of 125 MPH. The plane brought two additions to Aloha's party: a back-up pilot dubbed "Tech" for technician, and a mechanic, known as "Max."

Special supplies were gathered including machetes, a supply of the drug-food *guaraná*, experimental Atabrine for malaria, snake serum, and a collection of gift items intended for the Indians: razor blades, matches in tins, fish hooks, small mirrors, tobacco. Before leaving Rio, Aloha signed a release that "absolved the powers-that-be of any and all responsibility for life and limb."

Aloha with Bororo male, the party named him Handsome

Arm bands, very tight to the flesh, called akiego, are muscle builders. Varying hair styles were created by the women using razor sharp shell. Aloha's scissors became very popular during her sojourn among the Indians.

Heat, fog and condensation were oppressive foes. Film, stored in boxes lined with thick carpet felt, did not sweat. The explorers were less fortunate. "For camera equipment we owned a heavy 1913 French 35mm newsreel tripod Debrie and one of the original hand-held, key-wind-motor 35mm Bell & Howells where you thread the negative from can to camera, blindfolded so to speak, with your sweaty hands inside an airtight, light-tight black cloth loading bag, cursing the while.

"From sundown to mid-morning (7 a.m.) a mist lay over the Mato Grosso lowlands, soft, white, tropic shrouds of the night. The dampness penetrated all things until the intense, blazing sun dissolved the fog. It destroyed our negative if we forgot and left the camera out of its heavy case. Condensation settled in our fuel tanks, humidity rotted scarce paper, molded our footgear, kept open our sores. In addition we had the harassment of jungle insects. Discomfort and hardship multiplied with the days and distances."

Aloha had special problems with the Mato sun. "At 1500 feet in the open cockpit the wrinkles remained pinched and white and did not tan. On landing, when we released our screwed-up faces, we looked like stage-whiskered cats."

Short reconnaissance flights were followed by more distant trips into unknown territory. Rising heat created hazardous flying conditions; smooth air passages were identified by observing flocks of winging pink ibis. The airborne adventurers were sometimes lured to a landing site by the smoke of an Indian village, or sometimes found a suitable landing spot on a river or lagoon where they spent the night listening to jungle screams, perhaps the splash of a crocodile or the supposed thrashing of a mass of piranhas.

On a beautiful day, on what had become an ordinary flight, the party met with unexpected disaster. Cruising high above uncharted terrain, a cough from the Junkers' engine led to the discovery of a serious fuel leak. With the plane rapidly losing altitude, Aloha at the controls struggled to clear the jungle and set down on the glossy surface of a distantly-seen river. Yet no sooner was the landing accomplished than the plane was caught up in the vortex of a giant whirlpool.

"In retrospect," says Aloha, "it was like seeing an old-time jungle movie and waiting for the hair-raising titles—but there were no titles at the foot of the scene."

Fate, enormous energy, and the unexpected assistance of a small party of Indians, delivered the party from the river. After the rescue the natives glided into the bush, leaving the stranded campers to the oncoming jungle night, intense in its silence, and to the anxiety of the unknown.

Morning brought a decision that the only means of communicating with the outside world was through their Indian rescuers. Remembering General Rondon's advice, the group searched out the native's nearby compound, apparently deserted in haste and fear, and placed enticing presents as evidence of their good intentions. For days they waited, careful never to lose sight of the plane or of one another, a problem in that "it was simple for a group of men to keep track of one lone girl, but a female attempting a minute of privacy from several men became one of the trials of jungle life."

On the fourth day, apparently overcome with curiosity about the strange white visitors from the sky, two warriors cautiously approached the plane precipitating an exchange of gifts: a string of fish proferred in return for mirrors, razor blades and metal spoons. Gradually over a period of time and the presentation of many trinkets Aloha and her party established sign-language communication with the inhabitants of the native compound and identified their rescuers as members of the Bororo tribe.

"The language of the natives was guttural, a singsong rhythmic monotone, quite fascinating. Our attire was rather incongruous in comparison with that of the males whose sole covering was a fiber string wound around the penis. Women wore a rigid wide belt-band draped from fore to aft by a soft woven cloth, a minidiaper. We found it much easier to make friends with the women; they responded more quickly, understanding our pantomime, eager to comprehend."

Winning over the chief proved considerably more difficult. Fearing a crafty, deceitful fox, Aloha and company approached their first meeting with the Bororo chief with much trepidation and many gifts. Their anxieties were somewhat allayed by the appearance of chief Taborí, a well-proportioned native with bearing befitting his rank, and by an apparently cordial welcome. Yet days went by and palaver after palaver resulted in no response to the small group's request for aid in contacting civilization. A devastating blunder nearly terminated the aid program before its beginning. In a special appeal, Aloha brought out the number-one gift, a twenty-foot rope of tobacco, and presented a length to each male, reserving the last and longest for the chief. Without comment the entire complement of warriors departed the village. After forty-eight hours of anxious silence the chief and his male entourage reappeared and conducted a lesson in Indian etiquette. It was made effectively clear that Aloha had belittled the chief before his warriors; future gifts were to be presented to the chief for *his* redistribution.

From this point the group got down to basics: a canoe, a guide, and the subject of the Fawcett expedition. After an estimate that it would take two or three weeks to reach the nearest settlement, it was decided that two men of the expedition would go for help with Indian guides; one would stay to guard the airplane; and Aloha would remain in the native compound with an elderly female Indian chaperone. The potential rescue party departed in a slim log canoe, launched with chanting prayers intended to placate the devil. No one prayed more fervently than Aloha.

Days and then weeks passed with no rescue in sight. There were periods of intense melancholy, time for reflection, and a movie camera always at the ready. The hand camera held a 100-footroll. Frequently neither the weather nor the natives were cooperative.

A bath *au naturel* in the river became a frequent social occasion shared with the females of the village. A tick inspection was another communal ritual.

"Chigoes plunged their toothed poniards into the flesh and gorged on blood until they were the size of black currants. If you pulled the tick off, the venomous claw remained embedded; infection! If the pest had already burrowed into the flesh and was not cut out, eggs were laid under your skin; maggots! The red-hot ember end of a twig was pressed against the blood-bloated body. It instantly released its hold on the flesh, totally withdrawing its venomous pincers. Anybody 'popped' anybody else's ticks, all done with complete composure and modesty."

Efforts to learn the 600-word Bororo language enabled Aloha to learn native ways and customs in everyday living. "In a way it is a primitive paradise. Women devote themselves leisurely to their family and housework. Throughout the heat of the day the men occupy their time weaving and making ornaments from animal claws, teeth and shells. Early they hunt; late, fish. The principal food is a mandioca root. They are not bedeviled by ambition and are therefore content to bask in the shade and to amuse themselves creating handcraft or going joyously off on a tramp. They do have ordeals and enemies. Savage massacres occur when one tribe invades another's hunting grounds or seizes its women. One constant threat to life and limb is the crocodile. Thousands of these ten to twelve-foot reptiles doze on the sunny beaches or lurk in the mangrove. Their guttural roar is heard far and wide. Under cover of darkness these beasts will drag their ungainly bodies up the river banks, even penetrating the village in the hope of snaring a sleeping dog or child. These scavengers are both dreaded and revered, souls of their Elders may lurk within."

Another grotesque sight documented by Aloha was the tribe's collection of nude macaws, their brilliant feathers ruthlessly plucked for use in native tiaras. The featherless prisoners crawled over roofs and rafters awaiting the regrowth of their blue, orange, green and gold plumage—thence to be plucked again.

After four long weeks of seemingly endless waiting, the distant thump-thump of an outboard motor signaled the arrival of the rescue mission, a prodigious feat accomplished against almost insurmountable odds. A feast and dance, ordered by chief Taborí, celebrated the momentous occasion.

Aloha in the cockpit
A Junkers F-13, a silvery flyers' delight, was provided for Aloha's aerial foray into the wilderness. The open-cockpit, cantilevered monoplane was made entirely of duraluminum with the exception of leather bindings and a wooden propeller—which was prone to warp in the oppressive jungle climate.

As the rescue team worked to replace the Junkers' damaged wooden propeller, Aloha continued her work with the camera. Beautiful, healthy young girls adorned themselves with elaborate necklaces of bone, teeth, and shell and giggled as they "had their faces put on paper." Everyone was covered at least below the hips to placate Hollywood censors.

Puzzled by the lack of nursing infants in the village, Aloha was told of smaller and smaller hunting grounds, and places where the Bororo no longer ventured. Both birth control and infanticide were practiced, and there was a preference season for matrimonial relations which took place in the mating forest rather than the family abode.

"Childbirth was an occasion for tumult in the village. Curious about the agonized screams of men, I went to the doorway of a hut. Two men lay on a low matting platform-bed writhing, waving arms, shrieking; to all appearances in labor pain.

Aloha at the ritual
Against all custom and tradition, Aloha was unexpectedly dragged in to witness the Bororo "Dance for the Eyes of Men Only." Her sweaty face, painted with greasy urucu red stripes, seemed a special target for swarms of small stinging insects.

It was an astonishing sight. The husband of a woman about to give birth lay beside his best friend acting out the ritual of labor pains to attract the unwelcome attention of, and to deceive Bopé (the devil), thereby leaving the mother to bear her child in the deep forest free from the devil's harm."

As overhauling work on the Junkers neared completion, preparations were made in the village for a sacred pageant known to the Bororo as "Dance for the Eyes of Men Only." In preparation for the ritual dance, each wife painstakingly adorned her mate, striving for individuality by facial painting, small feather tufts in the ear lobes, perhaps pendants hung through a slit lower lip. Eyelashes, eyebrows and temple hair were expertly plucked out. "Warriors began appearing in full regalia, their skins gleaming blood red with glistening *urucu* grease, arms and shoulders decorated with a covering of soft white down. In a laborious process the down was applied so adroitly that no red grease marred the pure white fluff, an amazing effect. Most startling and impressive were the diadem fan-crowns of grand plumage."

Thousands of palm fronds were gathered to form a solid stockade encircling the dance area and excluding females from the ritual. For the woman who spied, the penalty was death.

As the exotic atmosphere developed, Aloha was in a quandary: "The warriors might take offense if I left, or become angry because I was present. I decided to wait and see. Quite without warning I was seized, shoved down to a mat. The cross-legged Indian before me resolutely held my chin and finger-painted large vertical and horizontal greasy red stripes across my face. Large male hands pulled my hair back, gathered every strand, knotted it into a bun as a foundation for the head bonnet he fitted into position. I fervently hoped they would not pluck my brows too.'

Against all custom and tradition of the tribe, Aloha was accepted.

"A chorus of young males chanted the incantation to the magic rites. Slowly the warrior dancers fell in, taking position, like an uncoiling snake, their arms touching but not linked, their bodies forming a writhing line, like the undulating motion of some prehistoric dragon.

"There would never be a theater opening quite so dramatic, so thrilling as this. The set, the cast was perfect. The song and the music low, throbbing, intensifying with powerful droning impact. The volume rose, the dancers thumped heavily on the hard earth, more men filed in. Some shook gourds, some blew a long basso profundo tube. The dancers' thudding feet built the rhythm, urged on by the power of the music. Exhorted by the chant loud and clear...the wail of the blood-curdling fugue, the pad-pad of the feet, the virile recoil of the leg muscles ...superbly majestic this slowly swaying advance of savages perpetuating their ancestral rituals."

Then in unison the warriors lifted their heads to one long bellow. It was the signal opening the ceremony to female presence.

"Now the women appeared, breaking down the high screen of palm fronds, some bearing gourds of water to pour over the reeking bodies, dousing the men as they gasp. Protesting without hope, I was dragged to my feet and thrust in line near the end of the serpent. Weary, I found the trudging, shuffling step difficult to keep up with. It was endless, hour after hour. More and more women broke through the palm wall, joining, lengthening the dragon, and the knee-bending shuffle rarely lost a beat. Women supported their breasts with their hands and one mother had shouldered her two-year-old. I was only half aware of agonizing muscles. Something about this mass nudity fascinated, hypnotized. Haunting flashes excited the mind. Had our own civilization also come this way?"

The delirium slowly subsiding, the winding line slithered through the doorway of the long hut. Exhausted dancers crawled to their mats. A weary Aloha, rolled up in her hammock, saw pale dawn. After twelve hours it had ended.

The following day a general feeling of lethargic good will prevailed. The Junkers was nearly ready and, knowing they would soon be able to make a getaway, the exploration party decided to broach seriously the question of the Fawcett expedition. After gifts of rice and wire, and a lengthy and serious palaver among the Indians, the chief used sign language to describe the elapsed years.

"He stepped deep into the river and with his stick caused a little whirlpool, then drew it larger and larger and plunged his arm deep into the design's center waiting to see our comprehension. We held up a photo. The chief stood before us; solemnly he twisted his head for negative as we had taught him, and made signs of paddling. The three white men would never paddle a canoe downstream again."

At last the hydroplane was in flying condition, gear and souvenirs loaded, all preparations complete for take-off. Somehow the group had a disinclination to break away, but their time had come. Before the morning breeze of sunrise ruffled the river's black glaze, the Junkers' engine roared to life and, with a small audience of Indians brave enough to stand by in farewell, the weary travelers lifted off for an uneventful flight back to civilization—Descalvados.

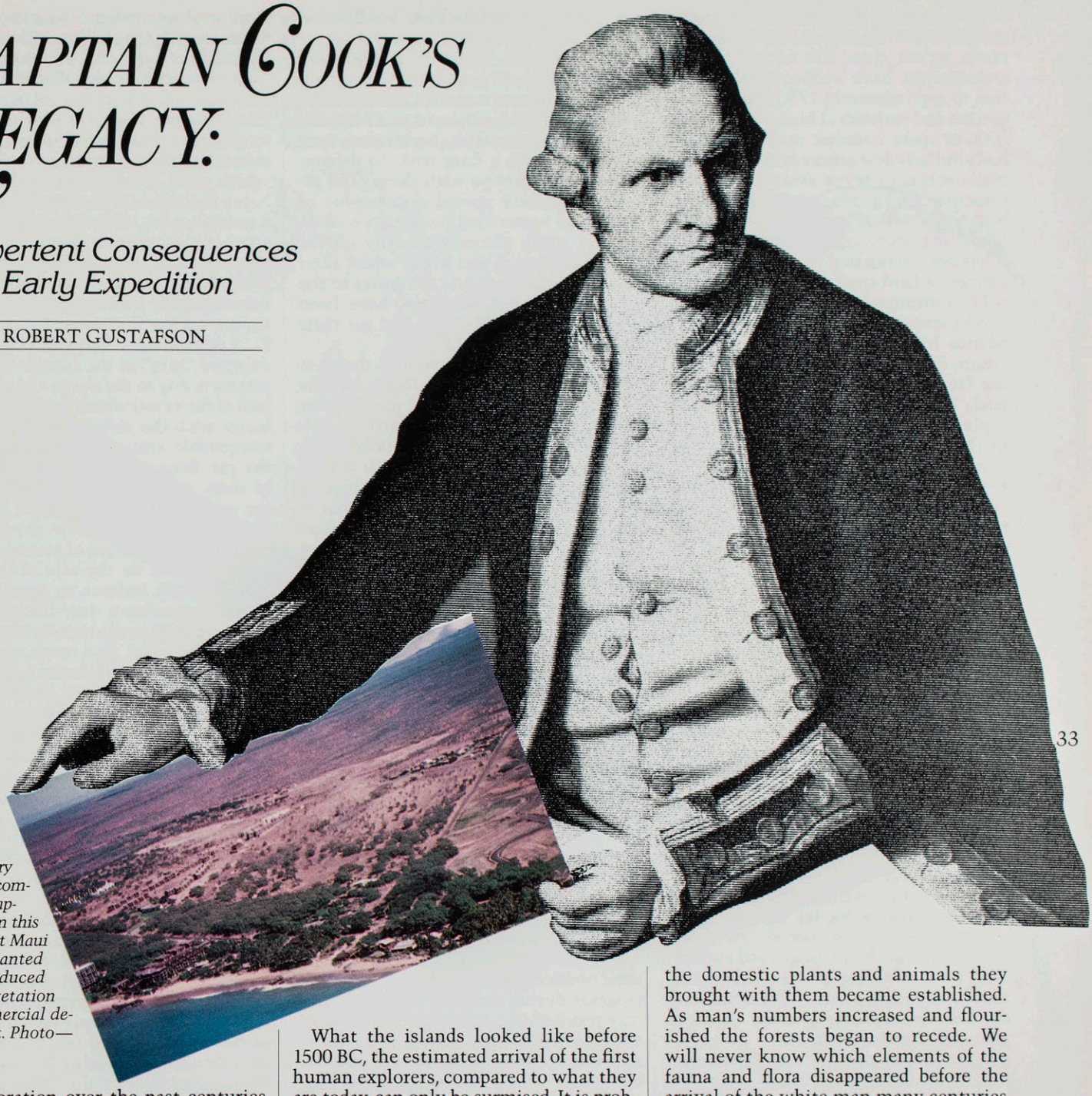
Enough adventure for one lifetime? Not for Aloha Baker, who continued to be challenged by the great unknown. Her film diaries include a fantastic trek across Africa; a pioneering 1700-mile drive across Australia's rain-soaked Nullarbor plains; adventures in New Zealand, the Philippines, Java, and much more. In addition to her films and personal appearances, Mrs. Baker is preparing a book about the expeditions and adventures that placed her in the front rank of globe-trotting explorers, both male and female. Her eyes have seen a world now changed beyond recognition, and history is richer for her courage, sensitivity and foresight in recording her incredible experiences. The Natural History Museum is also richer because of her generosity. Thank you, Aloha Baker.

Dawn Hattenbach, a former public relations professional, is now a touring docent at the Natural History Museum of Los Angeles County.

CAPTAIN COOK'S LEGACY:

Inadvertent Consequences of an Early Expedition

by ROBERT GUSTAFSON



Lowland dry forest has completely disappeared from this area of East Maui now supplanted with introduced weedy vegetation and commercial development. Photo—D. Minor

If exploration over the past centuries has opened up new vistas to man, it has also brought about tremendous change. Quite often this change has been abrupt and frequently irrevocable. Perhaps nowhere is this more prevalent than on islands. Because islands possess such fragile ecosystems it does not take much disruption of the native fauna and flora to upset that delicate balance. Introduction of exotic plants and domestic animals into a virgin area can wreak havoc with the environment if they are allowed to escape and naturalize. Not only do they compete with endemic organisms but they also can introduce foreign diseases with devastating results. With this thought in mind let us look at the plight of Hawaiian wildlife.

What the islands looked like before 1500 BC, the estimated arrival of the first human explorers, compared to what they are today, can only be surmised. It is probably safe to assume that they were then forested down to the sea. Today most of the lowland dry forest, that on the leeward sides, has almost totally disappeared. On the windward sides, typical wet forest still remains but has been invaded by introduced organisms, be they plant or animal. When the first Polynesians touched the pristine sands of Hawaii, they encountered a land of varied topography with a vegetation that offered little in the way of sustenance. There were no coconuts, no bananas, breadfruits, taro, yams, arrowroot, etc. There were no pigs, goats, cattle, sheep, rats, mongooses or other food sources. In essence the land was inhospitable. The sea was their lifeblood and survival until the domestic plants and animals they brought with them became established. As man's numbers increased and flourished the forests began to recede. We will never know which elements of the fauna and flora disappeared before the arrival of the white man many centuries later, but the decline and extinction process certainly began long before Cook landed in 1778.

Since the Hawaiian Islands are isolated in the mid-Pacific, effectively cut off from any major oceanic currents, the dispersal of biota to them was a happenstance occurrence. There is no geological evidence to support that the Hawaiian chain was ever connected to a major land mass. They are totally volcanic in origin. The islands of the Leeward group (Midway and Kure west to Nihoa), part of the Hawaiian chain, are now pretty much reduced to reef and atolls. A similar fate will one day meet Kauai, Oahu, Molokai, Lanai, Maui and Hawaii.

A disharmonic flora and fauna occurs

in the islands because many major categories of organisms never reached them. Fewer than 300 ancestral plant immigrants have subsequently given rise to approximately 2750 species, subspecies and varieties of higher plants. The 5000 or more endemic insects probably had similarly few antecedents, while the introduction of seven avian species was responsible for producing the entire land bird fauna which includes the endemic family of honeycreepers, the Drepanidae. It has been estimated that the 1200 or so species of land snails were derived from only 24 immigrant mollusks.

Whether these organisms reached the islands by virtue of wind dispersal or storms or were washed ashore as flotsam, the fact remains that the Hawaiian Islands have evolved a unique assemblage of plants and animals found nowhere else in the world. Some groups diversified quickly due to an interplay of several factors resulting in part from the continued, occasional introduction of a new form. Except for an indigenous bat, no mammals ever reached the islands until the arrival of man. In their absence, a fauna and flora evolved with no defenses to highly aggressive and competitive plants and animals that were to come at a later time. Many species became narrowly specialized and disappeared quickly in the face of competition.

If we examine the endemic plants of Hawaii, we find a unique flora rich in some elements and quite impoverished in others. There are no native gymnosperms, no willows, oaks, maples, etc., usually associated with north temperate regions. But many families widely represented in the old and new world tropics are also poorly represented, such as the orchids, palms and gingers. Yet the flora is quite remarkable for its unusual composites, like the silverswords, its woody violets, amaranths, plantains and euphorbias, its fascinating arboreal lobelioids, and its distinctive ferns, liverworts and mosses. Unfortunately many of these plants are presently in grave danger of extinction. Even before man first began to colonize the islands many organisms were beginning to vanish because of the following factors: their inabilities to compete, their highly localized geographical distribution, or simply because of too much interbreeding.

Whether the islands were discovered by pure chance or by purpose is not known. With the arrival of the first wave of Polynesians from the Marquesas about 600 AD, change came gradually upon the land. Domestic animals such as pigs, dogs and fowl made their appearance and the impact was probably immediate. When the "long voyages" from the south stopped about 1200 AD, the people of Hawaii were effectively cut off from the outside until that fatal day in January of 1778 when Captain Cook arrived on Kauai from Tahiti. From this point in time the rape of Hawaiian wildlife became a fait accompli.

Cook brought to the islands English breeds of pigs and goats. In 1793, Captain George Vanouver, one of Cook's former officers, brought cattle from California and thus mammalian herbivores were unleashed upon a flora with no defense mechanism to cope with them. The results ultimately proved catastrophic to the native vegetation. Feral goats took to the dry, rocky places, especially on the islands of Hawaii and Maui, where their ravages of native plants continues to the present, although measures have been taken since the 1930's to reduce their numbers.

Cattle also became a serious threat to native forests during the 1800's but the damage had already been done before attempts at their control early in this century. In many places not only is the vegetation gone as a direct result of feral animals, but the topsoil as well, leaving in its wake a barren wasteland that is irreclaimable. Even since the 1950's other mammals have been introduced for sport —mouflon sheep, mule deer, and pronghorn antelopes. When the vegetation disappeared so did many of the native birds because their habitat was destroyed. Rats and pigs have been responsible for great reductions in ground nesting birds.

Then of course there is the mongoose. This avian predator was originally introduced to control rats, which had become pests in sugar cane fields. Its arrival dates back to the late nineteenth century and it now has become a widespread pest on most of the islands in the chain, preying not only upon native birds but on introduced game birds as well. Only Kauai has been spared the mongoose but there is a strong possibility that the animals may have finally arrived there as well.

The Leeward Islands also have had their problems. Feather collecting by the Japanese during the early twentieth century resulted in a wholesale slaughter of seabirds which nest in many of these atolls. It is estimated that over 300,000 birds were killed on the island of Laysan during the year 1909. And if that was not tragic enough, Laysan's remaining birdlife was destroyed by rabbits, introduced to the island in 1903, which multiplied without the presence of natural enemies until the island was entirely stripped of vegetation in twenty years time. By 1923 Laysan was a desert. The Laysan millerbird and honeycreeper became extinct and the Laysan rail as well. The rail had been introduced to Midway Island in 1891 and thrived there until the Second World War when rats from Navy ships escaped and exterminated the birds. Today the Leeward Islands are part of a national wildlife refuge.

During the eighteenth century sandalwood became one of the world's most desirable woods, highly prized for its close grain and exceptional fragrance. White sandalwood *(Santalum album)* from the Orient was the primary source. Subsequent to Cook's discovery of the Hawaiian Islands the word spread that these islands were forested with great numbers of sandalwood trees. There are several endemic species of *Santalum* which grow in Hawaii and their plight began in the year 1791 when Captain John Kendrick, a fur trader from America, left some of his sailors on Kauai to collect the precious wood. Between the years of 1810 and 1820 the market soared and the sandalwood trade became Hawaii's greatest export, selling in Canton for upwards of $125 per ton. One can still observe sandalwood "pits" in the islands today. The pits were dug to the shape and size of the hull of the vessel which was to be used for barter with the chiefs in exchange for a comparable amount of the wood to fill the pit. Because of greed vast numbers of trees were felled in order to satisfy the insatiable demands of the Hawaiian chiefs, who had by now grown accustomed to some degree of material wealth brought about by the sale of the wood. The demands became so great that the chief's commoners were literally forced to devote their entire time to locating and logging the wood. As a result, agriculture suffered and for a while the islands were threatened with famine. Because there was no reforestation program, and because of the dissatisfaction of the commoners whose monetary gains were so slight that they deliberately destroyed seedlings in order to wipe out the trees, the industry folded before the year 1845. Unfortunately the sandalwoods of Hawaii never fully recovered. Only small remnants remain of their former abundance.

Tree ferns of the endemic genera *Cibotium* and *Sadleria* are some of the most common elements of Hawaii's wet forest. Yet their existence was threatened during the nineteenth century by another industry that had sprung up. The croziers or tightly curled new fronds are covered by a dense, brown, silky hair which the Hawaiians called *"pulu."* They used this material to embalm the dead. Because *pulu* was suitable for stuffing mattresses, vast quantities were gathered and shipped to California during the mid-nineteenth century. It is estimated that over 600,000 pounds of *pulu* were exported in the year 1869 alone. By 1885 the industry ceased when other material became available. Tree ferns were again threatened in the 1920's when they were exploited for starch in their trunks that could be used either for laundry or cooking. Fortunately this usage was short-lived. Today wild pigs uproot the ferns for their starchy trunks and it is not at all uncommon to observe the mangled remains of *Cibotium* when hiking through wet forests.

Hawaii's magnificent silverswords

(Argyroziphium sandwicense) were practically exterminated early in this century due to the combined ravages of goats and man. Apparently the plants were fairly abundant before the turn of the century and it was a great "thrill" for tourists to uproot them and watch them roll down the slopes of the crater. In addition they were collected, dried, and shipped to the Orient as souvenirs or decorations. Today, with protection in the National Park, they are staging a comeback but are pitifully few by comparison with their former numbers. The silverswords on Mauna Kea on Hawaii have dwindled to less than fifty plants and even though they are now protected it is probably too late to save them.

The mamo (Drepanidis funerea) *from Molokai is now extinct. Destruction of its habitat undoubtedly sealed its fate. From Wilson & Evans, Aves Hawaiensis.*

Oo's (Moho apicaulis) *left, from Oahu and* M. bishopi, *right, from Molokai are both extinct Hawaiian honeyeaters. Their tufts of yellow feathers were used by the Hawaiians in making the famous feather cloaks. Only the Kauai oo remains with less than a handful of individuals in the wild. From Wilson & Evans, Aves Hawaiensis*

Reforestation policies were initiated at the end of the nineteenth century when it became apparent that much of Hawaii's valuable watershed had already been lost and what remained had to be protected. Barren areas were replanted with exotic trees instead of using native plants with the result that many of the introduced species flourished and began to outcompete several of the endemics. Guavas *(Psidium sp.)* have formed thick forests at lower elevations and it is not at all uncommon to see them intermixed with native species above 4000 feet. Koa Haole, *(Leucena Leucocephala)*, which was introduced about 1864 as fodder for cattle, now covers thousands of acres of land in the drier regions of all the islands, where it forms virtually impenetrable thickets almost to the exclusion of any other plant.

Many garden ornamentals were allowed to escape and now pose serious threats to the native flora because of their highly aggressive nature. These include the gingers, melastomes, passionflowers, lantana, New Zealand laurel, and especially the raspberries and blackberries which seem to be ubiquitous. Instead of planting the native koa *(Acacia koa)*, Hawaii's most valuable timber tree, or the mamani *(Sophora chrysophylla)*, foresters chose Eucalyptus, pines, silk-oaks, etc., as viable alternatives further disturbing the ecology. To this day the bulldozing of native forests continues. Landowners apparently do not like to be told that their property contains rare and endangered species and the best way to cope with that fact is to destroy the evidence.

Mention should also be made about introduced insects and in particular the mosquito which was unknown in the islands until 1826, when it was probably introduced on Maui from ships from Mexico. The avian fauna of Hawaii evolved without the presence of bird malaria or pox which arrived subsequent to Cook, and have undoubtedly had a profound effect upon the reduction of the endemic birds. The introduced Chinese rose beetle seems to have a preference for members of the Malvacae, at least in cultivation, often completely riddling the foliage. Several rare endemic Hawaiian Hibiscus relatives such as *Kokia* and *Hibiscadelphus* which are almost extinct in the wild, have been successfully grown in several botanical gardens in the islands. However, they appear to be a prime target for the ravages of this nocturnal beetle which could endanger their existence even in cultivation.

The list of inadvertent ecological blunders that have beset Hawaii is a long one, but it does emphasize the long-term effect of opening up a new land as the direct result of a major expedition. Cook's voyage was historically important, but in its wake profound biological alterations came upon the islands which continue even to the present day. Although "good" intentions (introduction of economical plants and animals, for example) were undoubtedly responsible for many of these changes, little or no foresight was given to the end results. The modern explorer carries a great responsibility when he first penetrates a pristine jungle or an unknown island because as he sees it for the first time, it will in all probability never be viewed in quite the same light again. If changes are to be inevitable, perhaps the introduction of exotic biota into a new environment, whether for economical or ornamental reasons, should be reviewed carefully in light of past mistakes.

Robert Gustafson is Assistant Curator of Botany at the Natural History Museum of Los Angeles County. He has an ongoing interest in the flora of Hawaii.

Sandalwood pit—Central Molokai—*This depression was filled with wood of the native* Santalum's *during the early 19th century. Photo—D. Minor*

Cyanea arborea—*This photograph taken by J. F. Rock depicts a magnificent arboreal lobelioid that became extinct early in the 20th century due to the ravages of cattle. Many other rare Hawaiian plants have met similar fates.*

EXPEDITIONS: A Third World Perspective

by RICHARD E. LEAKEY

The term expedition has a romantic aura emanating from implications of fantastic discoveries in exotic places, discoveries that were traditionally made under rigorous conditions of great personal hardship. With the advent of modern technology, travel has become a great deal easier and much of the hardship has been taken out of such voyages of discovery. I predict that expeditions will continue to play an important part in the affairs of museums but their nature and objectives will be rather different.

During the past few decades, tremendous progress has been made in the scientific capabilities of countries that were formerly considered remote parts of the globe. Throughout the third world, museums and research institutions have been created and developed with aims and objectives closely comparable to those of longer-established institutions in Europe and North America. Moreover, such countries are becoming increasingly conscious of matters relating to their national heritage and accordingly have instituted conservation laws, antiquities acts and similar legislation designed to protect their interests. Thus in many respects the days of the "old-style" expeditions, involving a uni-directional flow of cultural and scientific objects to the wealthier western museums, are over. In future it will seldom be possible for such institutions to acquire new large collections of biological, fossil and ethnographic materials.

As a corollary to their strictly enforced conservation policies, many of the third world countries are deeply concerned about what amounted to the systematic looting of their cultural heritage during former colonial times. Mounting pressure is being brought to bear in efforts to secure the return of such materials. This is unquestionably a very sensitive issue on the part of both the original and current owners of these treasures but, from the point of view of a third world country, their return is clearly justifiable. It is hard for a nation to accept that the most spectacular examples of its early culture, objects of great emotional relevance to the country concerned, now form parts of the collections of foreign museums and are thus inaccessible to the majority of its people. Sensitive feelings are further inflamed when the objects in question are not even put on display in overseas museums because of lack of available exhibit space. It is similarly frustrating for biologists and paleontologists in the developing nations to become aware that the type specimens of their flora and fauna, both living and fossil, are housed overseas and are not readily available for study. Small wonder, then, that expeditions mounted by foreign museums are being viewed with increasing suspicion by the countries being visited.

I would not wish to convey the impression that expeditions with appropriate objectives are not welcome in countries such as Kenya, although I would stress the term *"appropriate."* The benefits arising from close collaboration with foreign scientists, permitting interchange of ideas and involving exposure to new methodology, are obvious. Similarly apparent is the fact that funding for projects that are primarily academically-orientated may rarely be accorded top priority in the budget of a developing country. Access to funding sources readily available to overseas scientists will enable the completion of projects that might otherwise have to be deferred for decades. Nevertheless I, for one, am deeply concerned that our own scientists and students should participate fully in such ventures, and that the products of collaborative undertakings carried out in Kenya should be made available to the

people of Kenya as well as to the international scientific community. I know that many of my colleagues throughout the third world share this concern. My country has recently instigated a policy whereby expeditions by foreign scientists are sanctioned only if they entail a distinct training component for Kenyan students, and I anticipate that similar policies will be adopted by other countries also.

Although museums have an important part to play in scientific research and in the dissemination of ideas, they are primarily repositories for materials of cultural, historic and scientific interest and should be strongly committed to displaying such materials to the general public. Indeed the success of a museum is normally judged on the interest generated by its exhibits. In third world museums, exhibit presentation is often predominated by topics of local interest, thus contrasting with the larger western museums in which exotic subjects are given disproportionate emphasis. Such differences are in part governed by financial limitations, in part by the greater role in basic education played by the museums in developing countries, and in part by the nature and size of the available collections. For the reasons I have mentioned, further additions to the biological collections of natural history museums will be mainly restricted to specimens collected locally. Moreover, replication methods are today so advanced that there seems little justification for original cultural materials, particularly those with emotional significance in their country of origin, to be retained in overseas museums. I anticipate that, in future, museum expeditions to foreign lands will have as their main objective the gathering of data rather than objects, and that the tangible products of their discoveries will be retained locally but made available internationally in the form of travelling exhibits such as the treasures of Hawaii and Columbia that were recently on show in Los Angeles.

Museums such as the Natural History Museum of Los Angeles County have a key role to play in the training of scientific and technical personnel of museums in the developing countries. Continued participation in overseas expeditions, in collaboration with appropriate local institutions, will not only enhance the progress of scientific research, for which such expeditions were mounted in the first place, but will also afford magnificent opportunities to foster harmonious international relationships. We would appear to be at the beginning of a new era involving truly cooperative ventures between the museums of the world and I find the prospect an exciting one!

Richard E. Leakey is Director/Chief Executive of the National Museums of Kenya.

CURATORS ON THE MOVE

(Continued from Page 2)

Cultural Exchange Act (the Fulbright program) and in addition to the comparative behavior work the Schreibers will be working with students in various Indian universities, the National Museum in Delhi, and the Bombay Natural History Society illustrating modern scientific methods and attempting to interest the people in the study of their wildlife. A collecting permit has been issued to our Museum and the Schreibers will be collecting specimens of birds to be preserved completely in alcohol. This type of specimen does not exist in any collection. The Grey Pelican is one of the most endangered birds of the world, with probably fewer than 500 pairs still remaining, and it is only found in India.

DR. FRED S. TRUXAL, Acting Assistant Director, and **DR. CHARLES L. HOGUE, Acting Chief Curator, Life Sciences,** both specialists in aquatic insects (Diptera and Hemiptera) have just returned from a trip collecting insects in the area of South and Southwest Africa. Although the New World has been the main area of our Museum's specialization research and collections, the Museum also has been conducting research in Africa since the mid-1950's, including particularly, work on birds, mammals, reptiles, and insects. Relative to the Museum's exhibit program, Africa has played an extremely strong role. The entomologists also spent time in Kenya, both collecting and involving themselves with Kenyan museum activities that relate to the Natural History Museum's interests.

DR. DONALD CHAPUT, Curator of History, is now in Australia, doing research in several mining districts that experienced Gold Rushes like California in the 1850's. Chaput intends to examine mining equipment and methods, especially in New South Wales and Victoria, as well as use manuscript and early mining publications that deal with that era. The Australian gold fields were discovered by a veteran of the California Gold Rush, and Chaput would like to arrange an exhibit in California of some California-Australia mining equipment and methods.

DR. LARRY BARNES, Curator of Vertebrate Paleontology, has been awarded a National Science Foundation Grant to excavate over a two-year period several quarries of the world-famous Miocene marine fossil deposit in Kern County known as the Sharktooth Hill Bonebed. The Museum has been for many years the main center of research on the bonebed. We have on display an unusually complete sea lion skeleton and an excellent whale skull from this bed. One quarry was excavated in the Spring of 1981. Another is in progress at this time. The Vertebrate Paleontology staff intends to collect extensively from the 14 million year old bonebed and to formulate theories as to its origin. All equipment is trucked to the site in the foothills east of Bakersfield and the crew remains at the site for the duration of the quarry excavation. Bulldozers are used to reach the bone-producing horizon, and delicate excavation techniques are used to expose the fossils. Specimens are carefully recorded on a grid system prior to removal. In addition to County and grant-supported staff, the quarry projects involve volunteer workers, many of whom are students or teachers.

PRIZE-WINNING UNDERWATER PHOTOGRAPHS

Prize-winning prints of the Nineteenth Annual International Competition of the Underwater Photographic Society are being displayed in the Director's gallery, Second Floor. The competition is worldwide in scope, and stresses the marine environment. These prints promote the art of underwater photography, increase our knowledge of underwater life, and provide an opportunity to display, evaluate, and recognize the contributions of underwater photographers to the science of preservation of the marine environment.

CORRECTION

The Summer 1978 issue of TERRA, "The Museum Speaks for Itself," was recently reprinted to serve as a Museum guide. In the reprinting, "A Message" (inside front cover) that was written by Giles W. Mead was inadvertently attributed to William B. Lee. We regret this error.

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Book Review

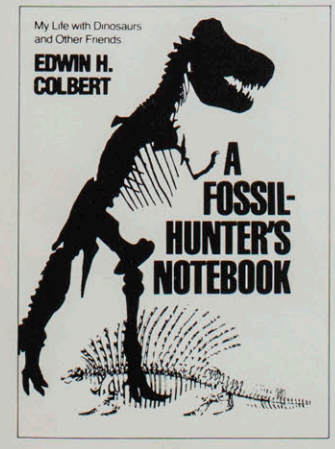
Museum Field Work Explained

A Fossil-Hunter's Notebook by Edwin H. Colbert (E. P. Dutton, 1980) is aptly subtitled "My Life with Dinosaurs and Other Friends." Paleontologist Colbert, who is no stranger to TERRA readers ("Dinosaurs with Horns," TERRA, Winter 1980), previously published several books which established him as The Dinosaur Doctor to a delighted lay audience. His book *Evolution of the Vertebrates*, a standard text for student, scientist, and amateur alike, is a lucid evaluation of the evolutionary gradation from fish to man. In his autobiography, Dr. Colbert reveals a research versatility hitherto known chiefly only to his scientific colleagues. Having begun his career with studies of Late Cenozoic age mammals of Nebraska, he progressed to the Early Cenozoic age mammals of Asia, and later turned to a world-wide study of certain amphibians and reptiles of the Mesozoic and Late Paleozoic times, eventually emphasizing the Permian and Triassic Periods. One is reminded of Darwin, who completed a definitive study of barnacles and turned to doing one on orchids.

While Dr. Colbert's early work was based on specimens near at hand either in the field or in the collections of the American Museum of Natural History in New York, where he eventually became Chairman of the Department of Vertebrate Paleontology, his later work involved travel to exotic places where he needed to ascertain which animals were to be found there as fossils. In pursuit of these fossils, Dr. Colbert takes us with him on adventurous "expeditions" to South America, Europe, the Near East, India, Africa, Australia, and Antarctica. Now retired from the American Museum of Natural History, Dr. Colbert pursues his work as Curator of Vertebrate Paleontology at the Museum of Northern Arizona, Flagstaff, and continues international travel.

No recent popular book explains the many meanings of museum field work as well as Edwin Colbert's *A Fossil-Hunter's Notebook.*

—Edward Wilson



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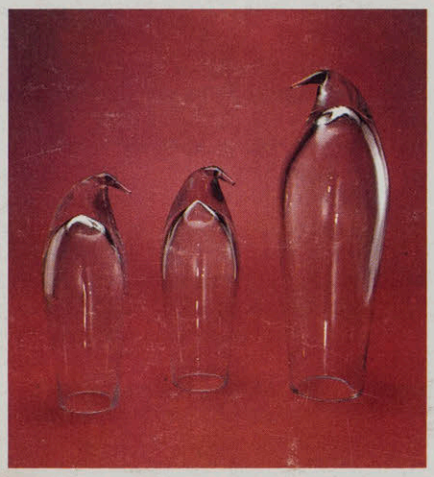
HERE IS JUST A SAMPLING OF WHAT WE HAVE TO OFFER...



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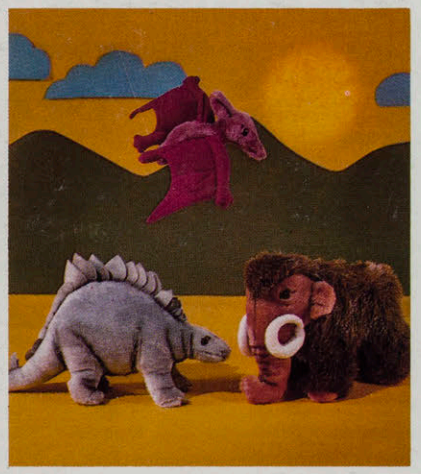
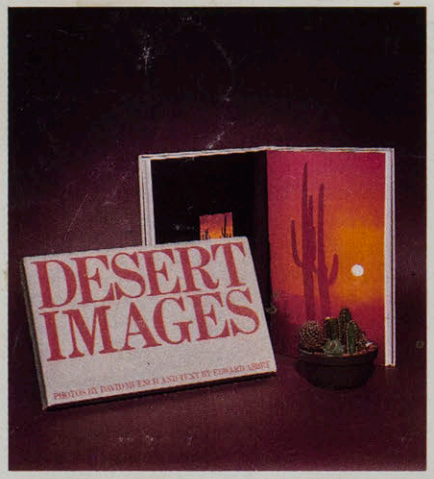
These dignified penguins stand 9½" and 14" high. They're part of a selection of fine handmade glasswork from the skilled artisans at the Blenko Company in West Virginia. $42 and $59

IN THE PAGE MUSEUM SHOP

Any child on your list will delight in these not-so-fierce prehistoric animals. These soft and cuddly pals come in all shapes and sizes. Pictured are a woolly mammoth, pteradactyl, and stegosaurus. Also available are triceratops, tyrranosaurus, and brontosaurus. $6.75 to $50.00





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